NOVEMBER 1961

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

UNIVERSITY MICROFILMS
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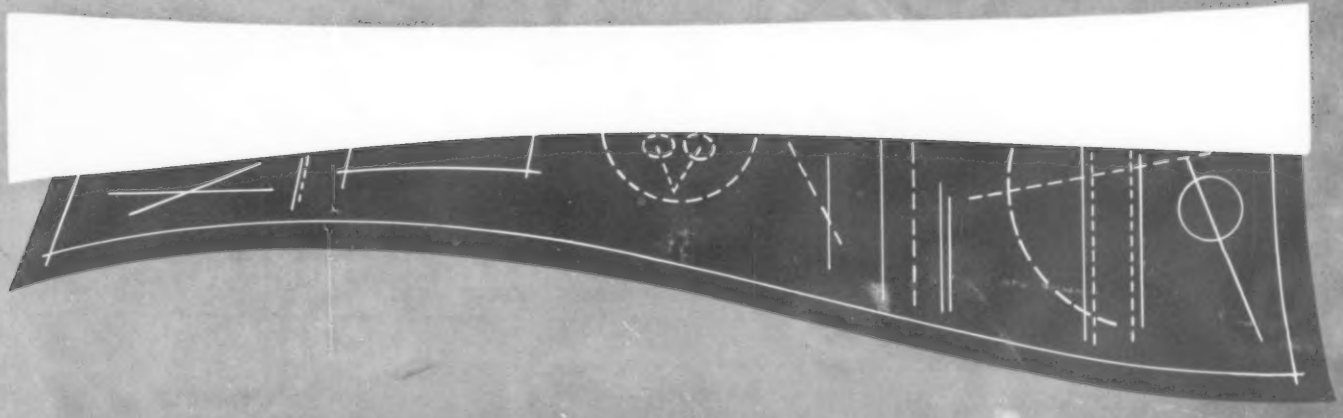
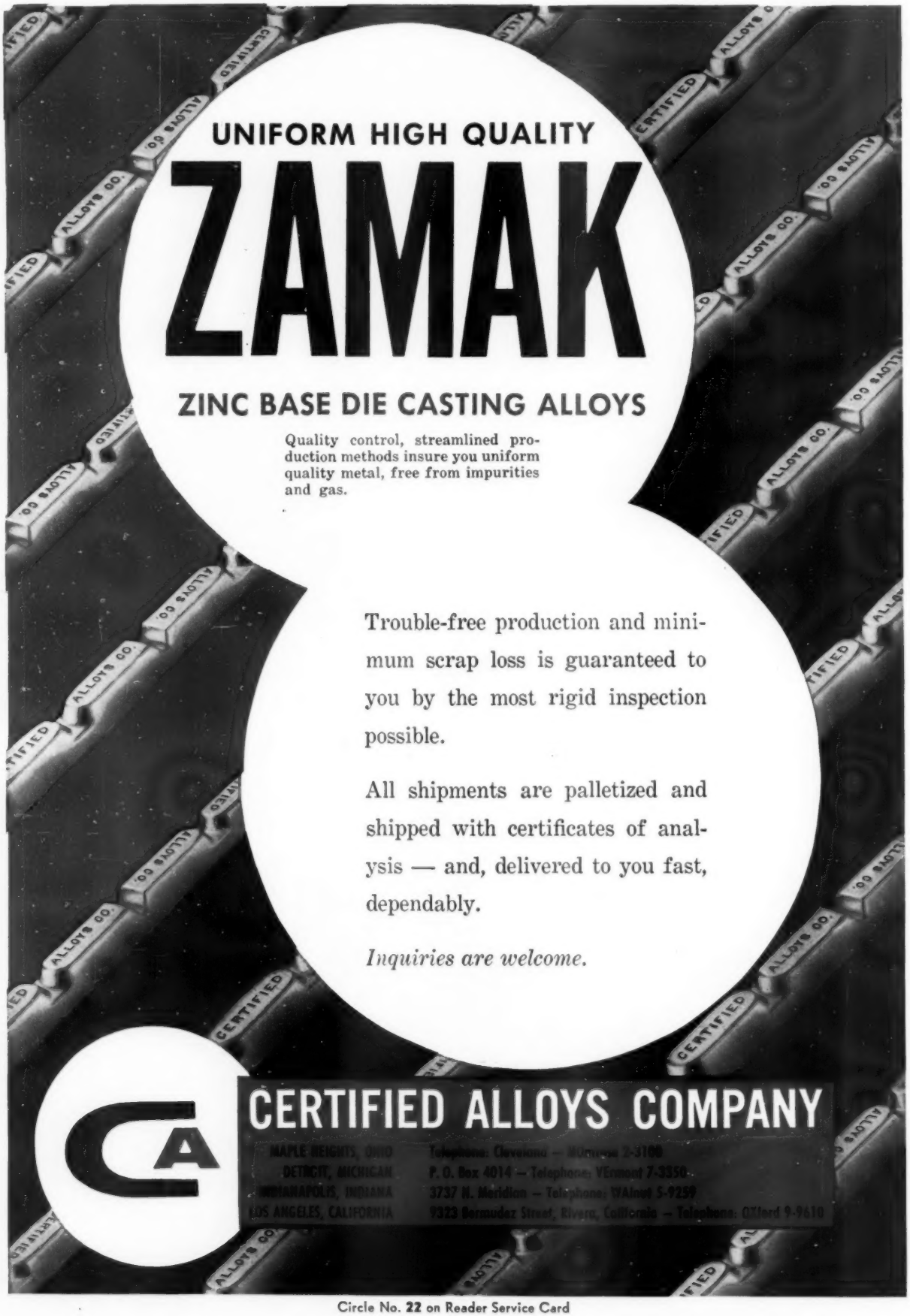
do you tell your vendor ENOUGH?



PMM design finishing & use of: Die Castings • Extrusions • Investment Castings • Permanent Mold Castings • Plaster Mold Castings • Powder Metallurgy Parts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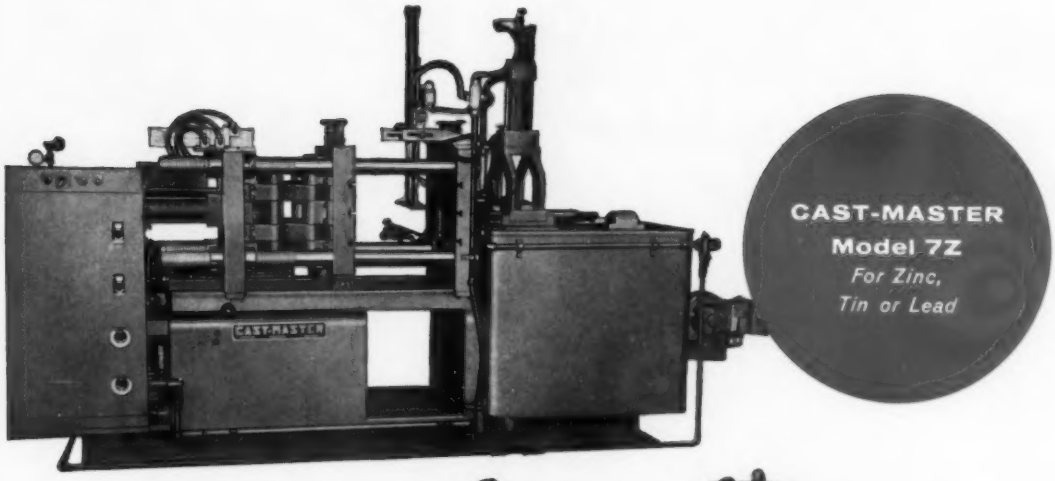

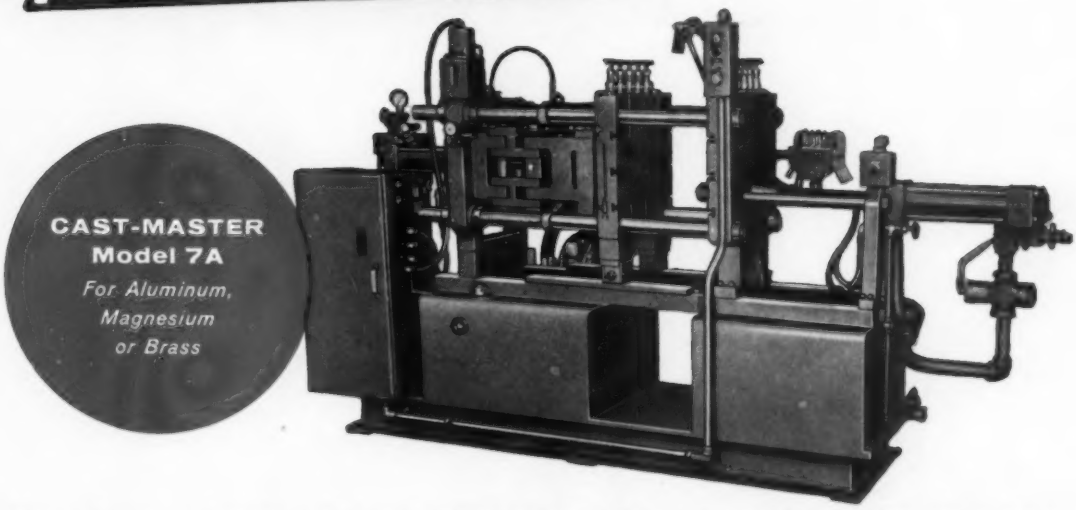

HARDWARE FINISH CASTINGS ON A VOLUME BASIS

SPECIFICATIONS

	Model 7Z	Model 7A
Die Locking Pressure	100 tons	100 tons
Distance between rods HxV	13½" x 13½"	13½" x 13½"
Tie rod centers, HxV	16" x 16"	16" x 16"
Tie rod diameter	2½"	2½"
Die mounting plates, TxHxV	3½" x 21½" x 21½"	3½" x 21½" x 21½"
Die thickness	4" min., 19" max.	4" min., 19" max.
Die stroke	4" min., 8" max.	4" min., 8" max.
Shot position	On center or 4" below	3½" below center
Shot cyl. dia.	2½"	3⅝"
Shot cyl. stroke	6½"	11"
Machine size, WxLxH	48" x 120" x 72"	48" x 120" x 58"
Weight, gross	6,900 lbs.	6,400 lbs.

CAST-MASTER Die Casting Machines are engineered for volume production. Here are two of the newest Cast-Master automatic models to be offered to the industry. Both are ruggedly constructed throughout and embody time-tested Cast-Master features that insure reduced maintenance, faster die set-up and maximum safety. You'll find these speedy 100 ton units tops for the production of high quality, dense finish castings.

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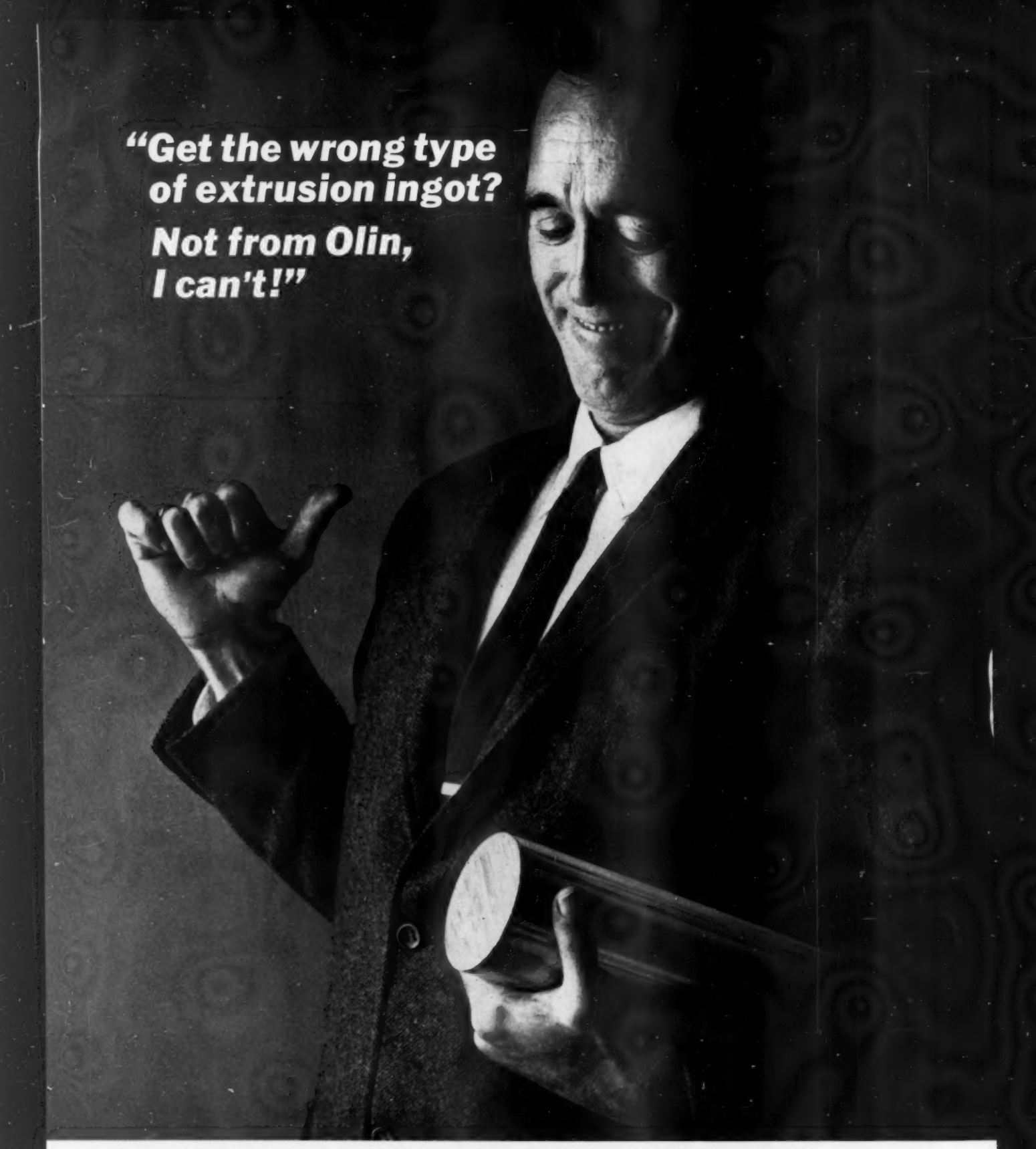

"When I called Olin for extrusion ingot, they didn't just write down the order—they started asking all sorts of questions about the end product, desired finish, strength, and so on—and sent a veteran extrusion specialist to help me produce a better product, faster. Just nosy? Not Olin! They know that every extrusion shop has variations that can mean the difference between profit and loss. There's an Olin extrusion ingot available for most every type of product or extrusion problem and Olin took the time to make sure I got exactly the metal I really needed." **Nobody thinks in aluminum better than Olin—from alloys to marketing. Want to talk to our consultants? Call your local Olin Aluminum Distributor or Sales Office.**

Olin
ALUMINUM

PMM November, 1961: Volume 19 Number 11

Precision Metal Molding

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41 **Buying Practices for Investment Castings**

Form developed by the Investment Casting Institute enables buyers to provide more specific product requirements for investment castings.

43 **Buying Practices for Extrusions**

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46 **Buying Practices for Powder Metallurgy Parts**

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50 **Value Analysis Can Get You More Jobs**

A fresh approach to cost cutting is helping companies save millions of dollars without sacrificing product quality.

56 **1961 ZINC DIE CASTING OF THE YEAR**

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58 **DESIGNING FOR POWDER METALLURGY**

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101 **A NEW FIRE RESISTANT FLUID**

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104 **A NEW APPROACH TO DIE CASTING AUTOMATION**

Hot metal, cast parts, and trim scrap are all handled automatically in a die casting plant designed for efficient operation.

FINISHING SECTION

63 **PURCHASING ROLE IN VALUE ANALYSIS**

Purchasing can support design and production in applying value analysis methods as illustrated by a case history involving screw fasteners.

DIRECTORY SECTION

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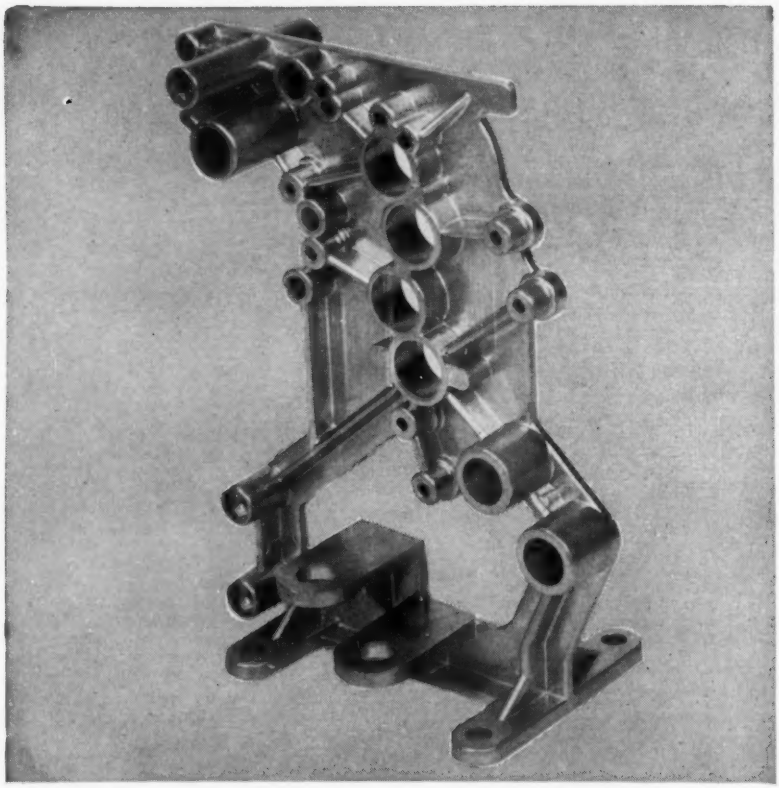

What other process could do it so well?

All things considered, there's really only one *best* way to produce this typical die casting application.

When you figure that it must be built at the lowest possible unit cost, must use a production method that is highly flexible to accommodate the unusual shape, and must maintain a variety of close tolerances . . . only die casting *could* do the job.

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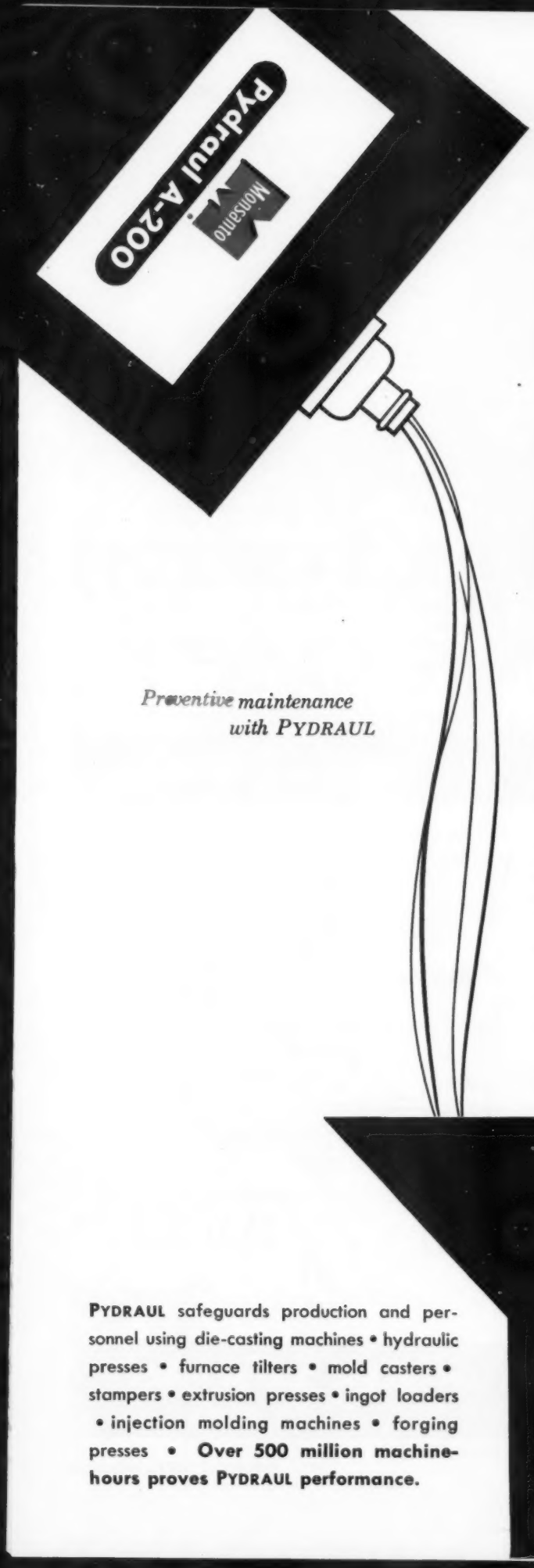

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Vapor Pressure	**Very low**	**High**
Fire Resistance	**Excellent**	**Excellent** *(provided water has not evaporated)*

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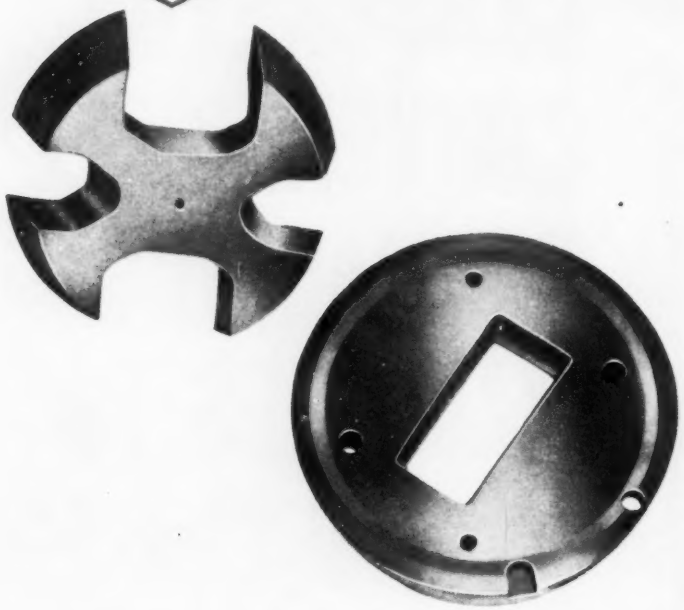

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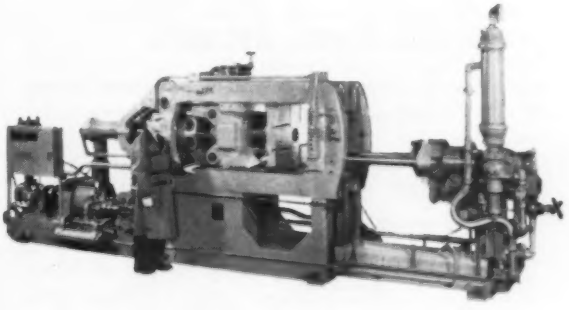

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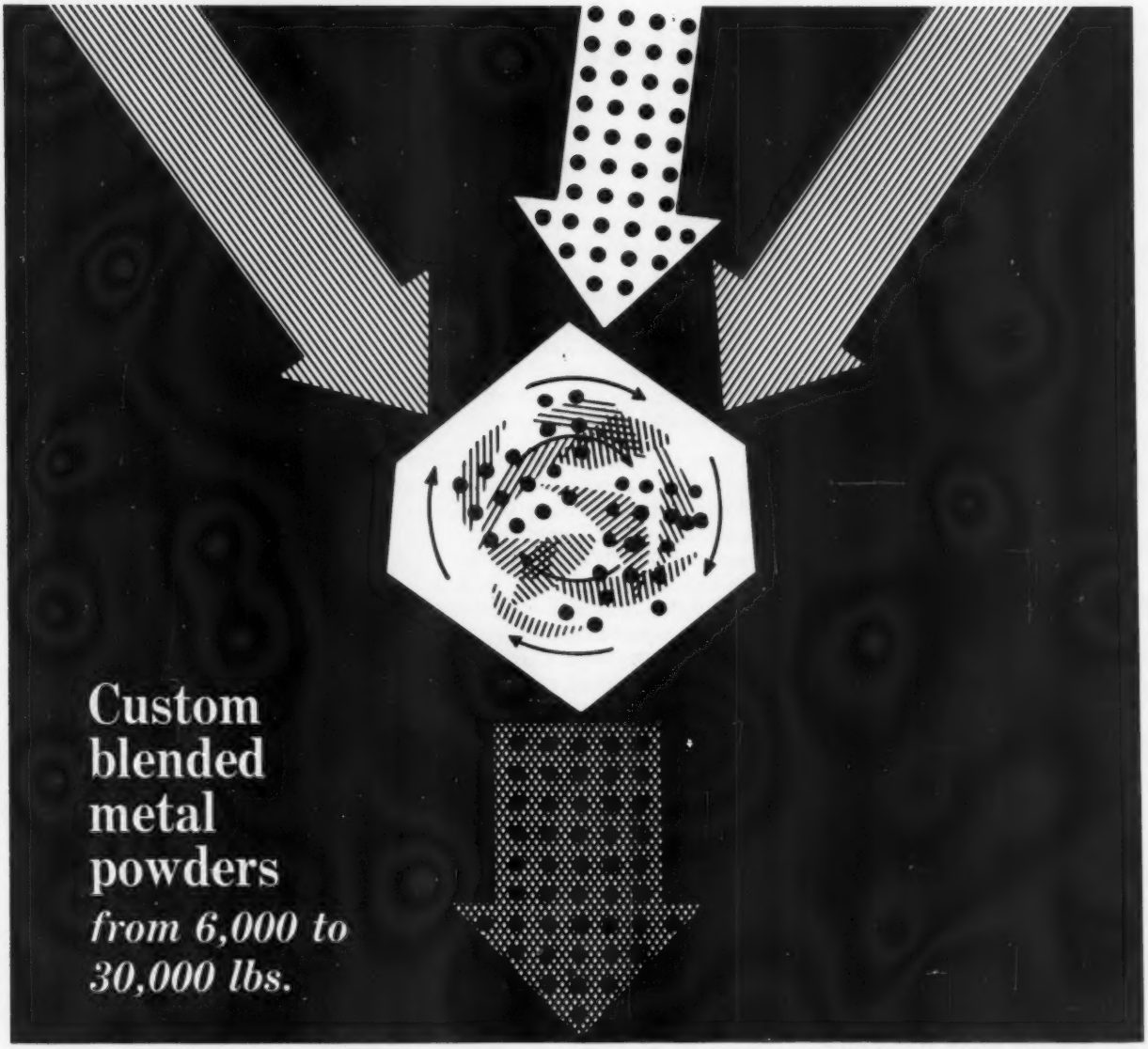

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And where high density is desired, Easton's exclusive RZ iron atomizing process offers the "C" Factor: COMPRESSIBILITY . . . CARBON COMPATIBILITY . . . CONSISTENCY.

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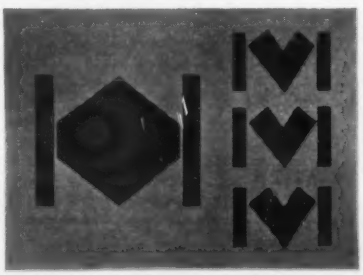

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This part for can making machinery now cast in a non-machinable alloy offers a very high degree of resistance to wear and corrosion. Results — costly parts replacement problems ended.

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PMM letters

the readers' forum

Centrifugal Casting

We are very much interested in obtaining information on a centrifugal process for molding small lure parts of zinc alloy weighing from 2 to 4 ounces.

Can you provide the names of manufacturers of centrifugal casting equipment and of West Coast firms that can turn out about 25,-000-30,000 units at low cost. —D.D.

Because of the highly specialized nature of the parts that you need, we do not know of any West Coast fabricator who could make the parts for you. We suggest that you contact Mr. Ells at the Dick Ells Co. in Venice, California. Mr. Ells is well acquainted with all of the casters on the West Coast and will probably be able to recommend some company to you.

Extruded Tubing

We are looking for a source of supply for non-ferrous thin wall finned tubing in sizes from 6" to 10" in diameter for an air-to-air heat exchange application. Please advise us of several manufacturers who can supply this item. —C.L.

We suggest you contact any of the following companies; Superior Industries, Inc., Youngstown, Ohio; Precision Extrusions, Inc., Bensenville, Illinois; or Aluminum Extrusions, Inc., Charlotte, Michigan.

You may find it difficult to get extruded heat exchanger tubing 10" in diameter from smaller companies. In that case, we suggest you contact the Reynolds Aluminum Co. or any other large extruder.

Extrusion Directory Error

On page 101 of PMM's Oct. '61 Extrusion Directory, Aluminum Extrusions, Inc., not Aluminum Shapes, Inc., should have been listed as a Charlotte, Michigan producer of aluminum straight extrusions. The correct listing is:

Aluminum Extrusions, Inc.
815 W. Shepherd St.
Charlotte, Mich. (M, F)

HARDENED STEEL DIE CASTING PLUNGER RINGS by AUTO DIESEL

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How to control casting quality:

use quality-controlled alloys from Reynolds Aluminum

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vertical and horizontal injection

and

HOT CHAMBER

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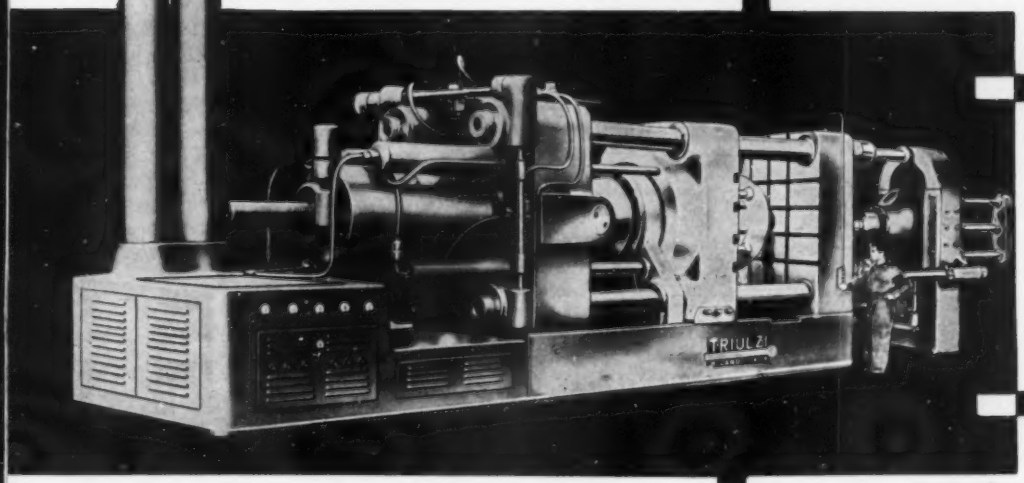

cold chamber CASTMATIC 2500
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positive clamping system by blocked piston
weight of the casting (Al. base) up to 130 lbs.

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are normally fitted with:

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- SIEMENS electrics
- automatic cycle equipment, with PROGRAM PRE-SELECTING PANEL

and can also be equipped with:

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- VACUUM DIE CASTING device
- AUTOMATIC FORCED LUBRICATION of all mechanical parts
- OVERSIZE WATER HYDRAULIC PLANT for fast cycling
- DEVICE for the automatic control of the oil temperature
- TRIM press, oil operated, fast cycling—for trimming burrs and sprues

OUR STANDARD PRODUCTION:

- deep-drawing presses
- Arbor presses—Extruding presses
- Coining, gauging, hobbing presses
- HIGH PRESSURE HYDRAULIC PUMPS
- INJECTION MOULDING MACHINES FOR PLASTICS
  Models with preplasticizer: from 3 to 705 oz.
  without preplasticizer: from ¾ to 28 oz.
- VERTICAL PRESSES FOR THERMOSETTING MATERIALS
- THERMOFORMING MACHINES FOR THERMOPLASTIC LAMINATES
- BLOW MOULDING MACHINES FOR PLASTIC HOLLOW ITEMS
- SCREWS AND COMPLETE EXTRUDING PLANTS for making films, rigid and flexible profiles, hollow coatings, plastics coloring and granulation
- PRESSES for POLYESTERS and for PLASTIC LAMINATES
- RECORD MOULDING PRESSES
- SPECIAL PLANTS FOR PROCESSING PLASTICS

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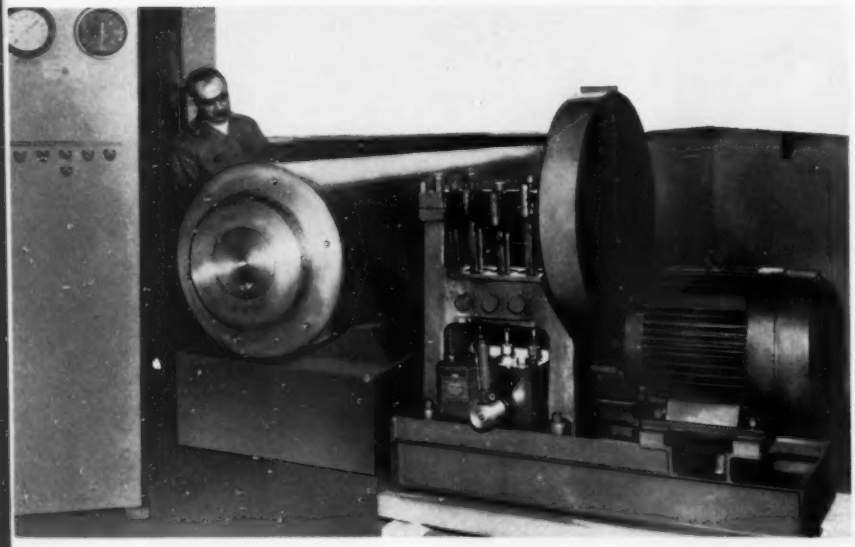
PMM

casting about *technical news of applications & processes involving precision metal molding*

Packaged Isostatic Pressing Units Available



Isostatic pressing systems for compacting powdered metals are now available as complete packaged units. Included in the units are pumping equipment, compression cylinder, pressure vessel, valving and instrumentation equipment.

Isostatic pressing is used to produce high density, uniformly compacted powdered metal parts, even if the parts are irregularly shaped.

As an example of some of the temperatures and pressures associated with isostatic pressing, beryllium is hydrostaticly pressed at 60,000 psi, then isostatically pressed at 6,000 to 12,000 psi at 950 to 1100°C.

The packaged systems can be designed for manual or automatic operation. Capacities range from small research-sized units, to large production systems such as the one shown in the photo. Autoclave Engineers, Inc. offer the packaged units.

New Furnace May Improve Quality of Cast Metals

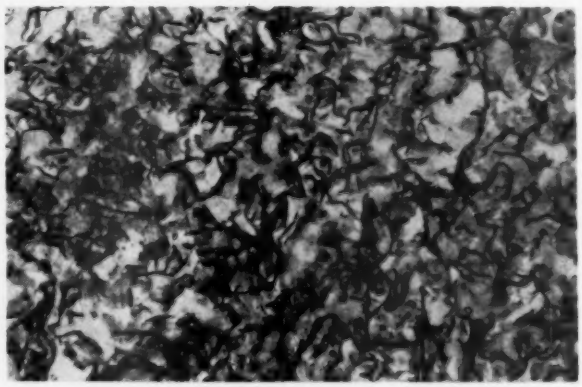
The first American tests of cast iron from a Tagliaferri low-frequency induction forehearth indicate an improvement in both tensile and transverse strength over metal obtained directly from the cupola.

The Tagliaferri equipment, which differs from other induction furnaces in the arrangement of the core, coil, and channels, was developed by Forni Elettrici A. Tagliaferri of Milan, Italy. The Hevi-Duty Electric Company is licensed to manufacture the Tagliaferri furnaces in the United States and Canada.

Hevi-Duty cites several reasons why the new furnace is expected to improve quality and lower costs. The horizontal channels can be cleaned easily. The regulation of low-frequency current can be expected to reduce operating costs and maintenance work on refractories.

The furnace design and low-frequency current set up a controlled stirring action that produces a fine-grained, well-homogenized metal with improved mechanical properties according to Elton E. Staples, president of Hevi-Duty.

Although more than 1000 Tagliaferri furnaces are in use in other parts of the world, the first installation of the equipment in this country was made recently at the Sibley Machine and Foundry Corporation in South Bend, Indiana.



A MATRIX nearly all pearlitic and with small size graphite is shown in this photomicrograph of a nital-etched test bar of gray iron obtained from the Tagliaferri furnace.

The Sibley unit is a four-ton forehearth used for refining cast iron from the cupola. Tests from this installation have shown improved mechanical properties even though the receiver has been used on an experimental basis, and the metal is not poured directly from the cupola.

more Casting About on page 17

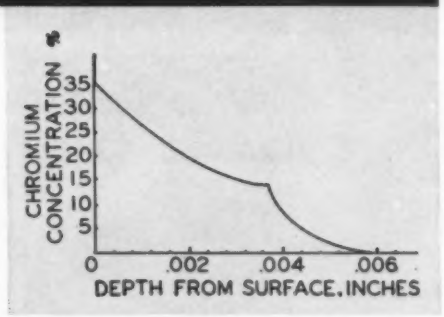
NOW!
PROTECTIVE COATINGS
FOR CORROSION RESISTANCE

by vapor diffusion at MISCO

The Vapor Diffusion of chromium into low-carbon steels, such as AISI 1010 to 1025, results in the formation of a highly corrosion-resistant protective alloy case which has a composition gradient similar to the 400 series of stainless steels. The chromium concentration on the surface is approximately fifty percent.

- **The protective alloy case exhibits excellent corrosion resistance to a variety of media such as tap water, weathering environment, steam, 3.% aqueous salt solution, nitric acid, fruit juices, milk products, soap solutions, and petroleum products.**
- **Usually, the protective alloy surface possesses a matte, silky grey appearance. However, by a modification of the processing parameters, a lustrous silver-colored surface may be achieved.**
- **The exact properties of the protective alloy case, such as the degree of corrosion resistance, surface hardness, and case ductility, are dependent upon the type of low-carbon steel, its cross-sectional thickness, and the processing parameters.**
- **The protective case may be adjusted to penetrate into the parent material to a controlled reproducible depth, usually 0.002 to 0.004 inches, is integral with the parent material, and will not chip, peel, or spall.**
- **These materials may be joined subsequent to the Vapor Diffusion of chromium by brazing, spot welding, seam welding, or arc welding with stainless steel filler rod.**

Our staff can assist you
in the solution of your protective coating problems.



Typical curve for vapor diffusion of chromium into low-carbon steel

Bolt with vapor diffused chromium coating

Misco Precision Casting Company

DIVISION OF HOWE SOUND COMPANY

MISCO

address inquiries to

VAPOR DIFFUSION DEPARTMENT

122 GIBBS STREET
WHITEHALL, MICHIGAN
Telephone TWinoaks 3-1515

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DIXON GRAPHOKOTE Dry Film Lubricants

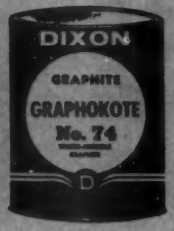
For
- Flask Pins and Snap Flask Parts
- Coating on Aluminum Dip Ladles
- Core Box and Pattern Parting Agent
- Monorail Tracks and Frogs
- Sand Conveyor System Parts
- Base Block Release Coating
- Lift Truck Guides
- Pattern Shop Equipment
- Chill Coating

An easily-applied liquid, dries quickly to form a hard, smooth lubricating graphite film on any surface where sliding friction is a problem. Withstands above-normal temperatures. Doesn't pick up dirt, sand or abrasive dust.

Instant drying #220 packaged in 16 oz. aerosol cans. Graphokote #95 paint consistency in qts., gals., 5 gals. and 55-gal. drums.

DIXON GRAPHOKOTE No. 74 Lubricating Graphite in Water

For
- Permanent Mold Coating
- Die Casting Release Coating
- Extrusion Die Coating
- Spot-Weld Coating
- Slush Mold Coating
- Forging Release Agent
- Core Release Coating
- Chill Coating



High quality graphite suitable for dilution in water. For brush, spray and dip applications. In qts., gals., 5-gal. and 55-gal. drums.

DIXON GRAPHOKOTE No. 1 Natural Colloidal Graphite in Oil

For
- Core Oven Chains and Bearings
- Automatic Plungers
- Die Casting Molds
- Permanent Mold Slides
- Shell Molding Machine Parts
- Kiln Car Bearings
- High Temperature Chains and Moving Parts

A new colloidal suspension of high purity *natural* graphite in oil, approved for use in automatic lubricating spray systems. Contains 10% by weight lubricating graphite and may be diluted with oil, kerosene and other hydro-carbons. Does not settle. In 1-lb. and 8-lb. cans and 40-lb. buckets.

DIXON '678' GRAPHITE LUBRICATING STICKS

For
- Band saw lubrication. Blades run smoother, last longer and give better cuts on castings and other metal stock.

A solid graphite formulation designed to provide maximum coating and lubrication under extreme heat and friction.

DIXON CARBOND CRUCIBLES and BASE BLOCKS For All Kinds of Melting

A modern Carbon Bonded product line, constructed to meet rapid thermal shock without damage, to heat faster and to resist oxidation in service. Dixon CARBOND CRUCIBLES and BASE BLOCKS are available in any size needed in Foundry operation.

DIXON GRAPHOKOTE No. 3 PLUNGER LUBRICANT Highest Quality Graphite

For
- Better Castings
- Longer Plunger and Sleeve Life
- Lower Costs
- Improved Operation

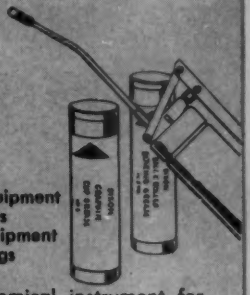
Reduces wear, prevents seizing, and galling, lowers friction when used on plungers of cold chamber die casting machines. In 25, 50 and 100-lb. drums.

DIXON GRAPHOKOTE No. 7 LUBRICANT (NON-FLAMMABLE)

For
- High Temperature Chains
- Permanent Molds
- Die-Casting Dies
- Shell Molding Machine Parts
- Forging Dies
- Oven Parts
- D/C Molds
- Extrusion Equipment Parts
- High Temperature Appliances

A dispersion of 10% Lubricating Graphite in synthetic fluid, suitable and approved for automatic spray applications. Produces a smooth, long-lasting, pure graphite coating when sprayed on hot surfaces. May be diluted with water, soluble oil, alcohol and similar vehicles. In 1 and 5-gal. cans and 55-gal. drums.

DIXON SPEED GUN and Grease Cartridges



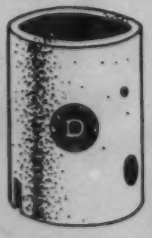
For
- Conveyor Equipment
- Machine Tools
- Handling Equipment
- Roller Bearings
- Ball Bearings

A clean, economical instrument for handling greasing problems. Develops 8000 lbs. pressure, suitable for Zerk & Alemite fittings. Eliminates the waste and grease contamination of hand-filled guns.

'No. 3' Cup Grease—A waterproof Graphite grease cartridge for damp area use.

'No. 375' Ball and Roller Bearing Grease—A high-temperature grease for bearing applications.

DIXON FURNACE LININGS and Silicon Carbide Covers



Linings tailor-made for *your* furnace or to fit all standard crucible designs. One-piece or in ring and sectional design. Cut installation time in half, lower fuel cost with faster melts, give longer service for lower maintenance cost.

Covers in all standard sizes or to meet *your* specifications; with flat or round groove. *Always uniform* for fit. Resist flame corrosion, minimize oxidation and cracking, keep heat *in the chamber* where it belongs.

DIXON SUPPLIES *COMPLETE* TECHNIGAL DATA SHEETS AND DETAILED APPLICATION INSTRUCTIONS WITH *ALL* PRODUCTS.

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DIXON
PRODUCTS
do the job better
FOR THE
FOUNDRYMAN

For more than 100 years, *The Joseph Dixon Crucible Company* has been intimately associated with the development and growth of the foundry industries in America.

DIXON research and engineering resources have been constantly devoted to originating and perfecting *better products* for foundry use—both in refractories and in lubricants. Every DIXON product is field-tested in actual use for long periods of time *before it is offered to the trade.*

DIXON crucibles, stoppers, furnace linings and other refractory products, both graphite and carbon-bonded, are famous for their economy, long service and high quality performance.

DIXON Natural Graphite lubricants, in scores of forms and suspensions, are noted throughout the foundry world and are *specified* for their sure and inexpensive performance under the most difficult and exacting conditions.

There is a DIXON product to help every foundryman to do a better job. Some are listed on these pages—but there are many others.

If you have a problem, with melting or with lubrication, DIXON can help you find the answer. We have been finding the answers to foundry problems for more than 100 years, and our engineering research facilities today are unsurpassed in America.

So remember—whatever your foundry needs may be, you can get the answer from **DIXON. Write for DIXON Foundry Brochure No. R 130 today!**

THE JOSEPH DIXON CRUCIBLE CO.

"Since 1827"

JERSEY CITY 3 / NEW JERSEY

D X N

EXCELLENCE SINCE 1827

casting about

Continued

Now Designers Can Specify Hollow Stainless Steel Extrusions

Hollow stainless steel extrusions are now available according to an announcement by the H. M. Harper Company. Previously, only solid extruded shapes were available in stainless steels.

To produce the hollow shapes, a variation of the Ugine Sejournet process is used. A billet is induction heated, coated with powdered glass, then driven through an extrusion die by a high speed hydraulic press. A ram in the center of the die produces the hollow bore of the shape, similar to the extruding of non-ferrous metals. The technique reduces costs and speeds the extrusion process, according to Harper officials.

The hollow shapes are available in a variety of exterior and interior configurations. Outside diameters range from 1½ to 3 inches. Minimum internal dimension is ¾ inch.

Improved Extrusion Alloys

Four new aluminum alloys for extrusion are now commercially available from Aluminum Company of America.

Alloy C914, a new version of standard alloy 6063, provides a better combination of mechanical properties and extrusion speed. Its special advantage is for applications requiring a matte finish. It can be hard anodized and is particularly good for a wide range of colors, including shades of bronze, black, and gray.

Alloy C58, newly available in ingot form, is especially suited for extrusions to be porcelain enameled. The alloy greatly increases the consistency of the adhesion of the enamels.

Alloy 4543, also newly available in ingot form, is used for architectural extrusions requiring a gray finish. Three versions of the alloy produce various shades of gray when anodized.

Alloy 6563 is offered by Alcoa only in extruded shapes. It can be anodized to brighter, more uniform, reflective finishes than other moderate strength extrusion alloys. It is recommended for trim applications requiring a specular finish.

Epoxy and Sand Make Low Cost Molds

A high-performance epoxy compound mixed with silica sand is being used to make low-cost molds and models. The epoxy-sand compound is room temperature cured. It provides tough, dimensionally stable molds and models costing less than plaster equivalents according to Hysol Corporation, developers of the process.

With the epoxy-sand technique drying and sealing are not required. Molds or models are ready for use in two to four hours and won't crack, peel, chip, or gouge.

Which of these parts should be investment cast?

. . . *All* the parts except the milling machine collet at the top right—which is a "natural" for conventional lathe work. Even the helical impeller the men are examining is best made as an investment casting—the helix is undercut in such a way that no cutting tool could reach inside to remove the metal.

"Naturals" for investment casting are usually parts that are too intricate to be made economically by any other process, or involve alloys or quantities that make them impractical to produce by other methods. In other words, when it looks as if you might have to sacrifice a design because its complexity makes the cost prohibitive, or forego a preferred alloy because it is difficult to machine, then it's time to take a long, hard look at investment casting.

But . . . it's not always as easy as it sounds to spot the parts that are "made" for investment casting. That's where the Arwood sales engineer comes in. He knows Arwood expects him to show a customer how to get the most from the process. To help keep your cost down he may have to suggest a filleted radius here . . . or a tolerance opened up there. Then too, on occasion he may readily have to admit the part should not be investment cast at all. However, he also knows that if you just can't have the part made any other way, Arwood will go all the way down the line to have it investment cast for you.

Our five plants cast every castable metal and alloy, including magnesium and superalloys. Each has its own research, tooling, quality control and production facilities. In short, if it can be investment cast, we can investment cast it.

LIKE TO LEARN MORE ABOUT INVESTMENT CASTING?

Write us for a complimentary copy of our 44-page manual, "Practical Guide to Investment Casting." Among other sections it includes practical tips on designing for investment casting, as well as analyses and physical and mechanical properties of all the metals and alloys cast by Arwood.

Machine the simple . . . cast the complex

A complete service from design through tooling, production and finish machining. Seventy-one engineering representatives from coast to coast.

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ARWOOD CORPORATION • **323 West 44th Street, New York 36, New York**

PLANTS IN BROOKLYN, N. Y.; TILTON, N. H.; GROTON, CONN.; LOS ANGELES AND LA VERNE, CALIF.

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3 BIG REASONS WHY

POTOMAC® M IS THE FASTEST GROWING DIE STEEL IN THE DIE CASTING INDUSTRY

1 Product Quality—the characteristics and properties you require in a die block . . . the machinability, stability, response to heat treatment . . . the right grade for your job.

2 Facilities—unmatched, by anyone, anywhere . . . production equipment specifically designed for the job at hand.

3 Availability—stock on the shelf, finished and ready for you . . . and job-shop delivery schedules, the industry's most dependable.

3702-5

PRODUCT QUALITY through...

Die quality clear to the center . . . upset forging quality . . . and in pressed billet stock! That's what puts Potomac M . . . A-L's H-13 Die Steel . . . in a class by itself. And *that's* the kind of quality that's absolutely mandatory for the intricate interior patterns in today's complex diecasting dies.

Quality like this has been associated with Allegheny Ludlum Die Steels over the past 20 years, during a period when die blocks were generally running less than 1200 pounds. Holding rigid specifications on ultrasonic soundness, grain size, and response to heat treatment in blocks of this size was one thing. Offering consistently higher quality in much larger die blocks . . . more and more the rule these days . . . is something else again.

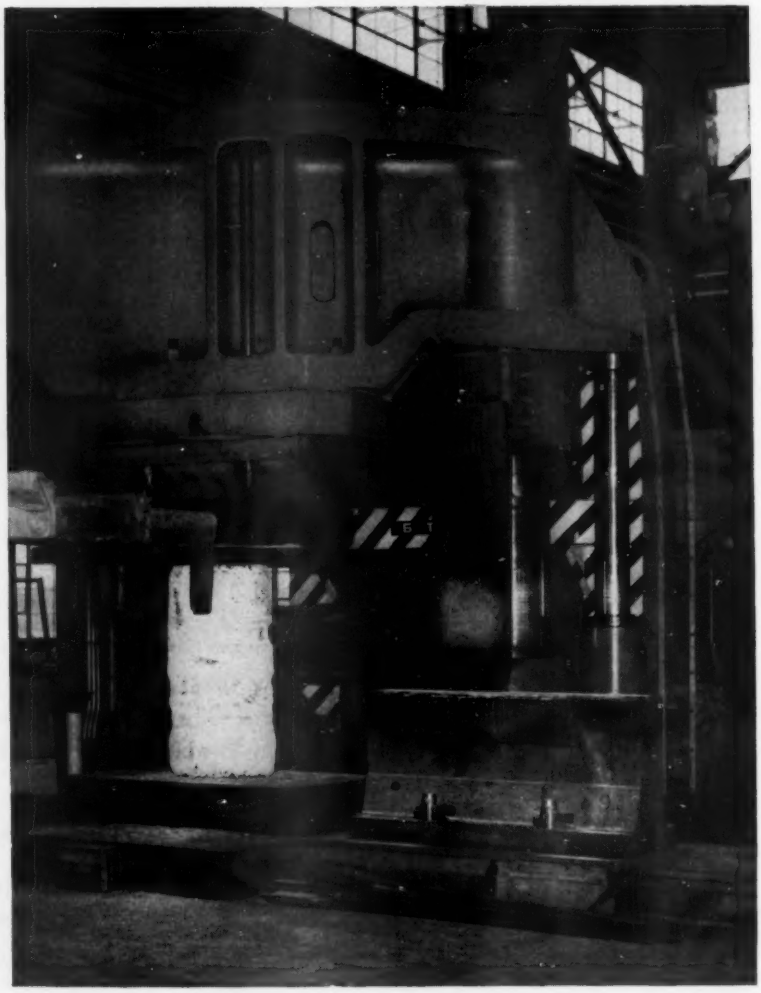
But, Allegheny Ludlum has become *the* specialist in doing just that . . . in providing these massive chunks of steel with the same center quality, machinability, and mechanical properties generally associated with much smaller sections.

And here's what it means to you

It means that Potomac M dies have greater strength in the transverse direction, and combine the ultimate in toughness with machinability and size stability. It means water cooling channels may be employed without the risk of cracking your dies due to thermal shock. It means better resistance to abrasion and softening at elevated temperatures . . . and, greater resistance to wash and heat checking. Most important, it means Potomac M is specifically created, and specifically processed for you . . . the most practical and useful material for your diecasting needs.

...A-L's 2,000 Ton Forging Press

Production equipment specially designed for the job at hand is part of the story. The direct pumping facility and fast, closely controlled action of A-L's unique forging equipment permits greater reductions in area from ingot to billet in a single heating, and results in complete ingot reduction in a relatively short time, with fewer reheats necessary. Coupled with A-L's ability to produce ingots up to 40″, of superior quality as-cast, the capacity of this press to rapidly and *completely* work such ingot grain structure inevitably results in an exceptionally high center quality in the billet, together with a refined grain structure more responsive to heat treatment. Substantially improved mechanical properties are obtained in the forged die blocks, with particular improvement in transverse tensile strength and ductility.



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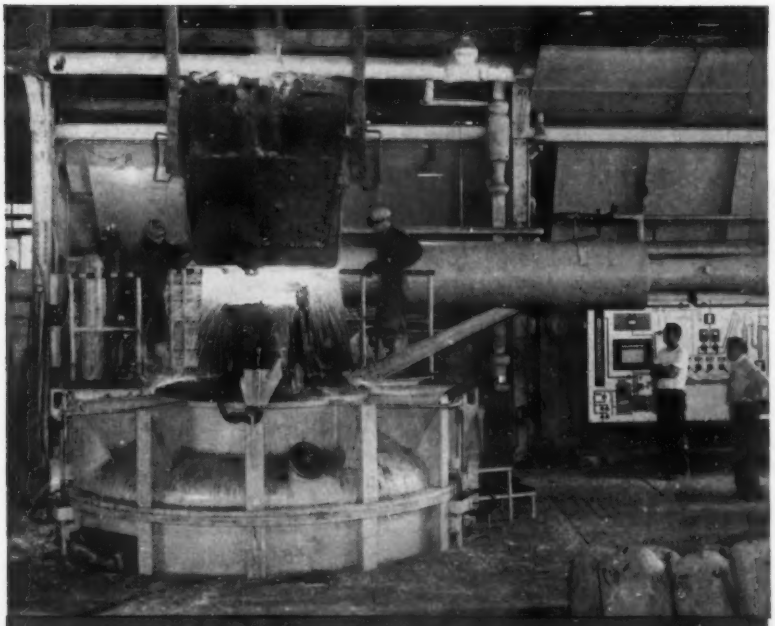
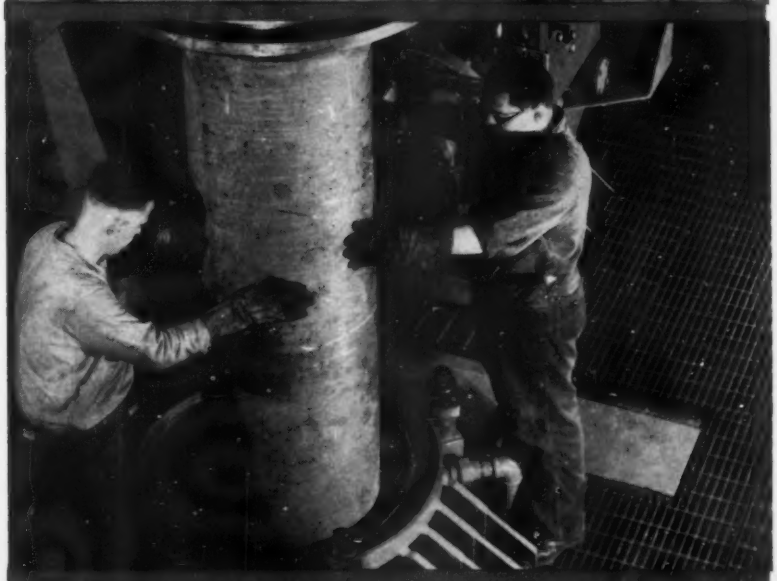




...A-L's Vacuum Degassing

Potomac M Die Steel is vacuum degassed . . . as a matter of routine. Vacuum degassing results in a cleaner steel, without blemishes or subsurface discontinuities . . . those imperfections which often reveal themselves in the die only after considerable machining has been done. Vacuum degassing produces a steel with lower oxygen and hydrogen content, with greatly reduced tendency toward microcrack formation, with fewer nonmetallic inclusions . . . a steel with better, more reliable mechanical properties clear through.

...A-L's Special Melting

For the unusual die applications requiring the ultimate in cleanliness and center quality, Allegheny Ludlum now offers its Consutrode® Potomac M. For requirements involving a super-finish die, the superior cleanliness of this vacuum melted product assures the die maker of an unblemished working surface clear through the workpiece. Equally important, this vacuum melted steel provides an improved transverse ductility in large die blocks, particularly applicable to dies which require the ultimate in toughness and resistance to thermal shock.

...A-L's Machined Finish

All bars and blocks in the larger sizes are milled to a finish that permits die layout right on the steel we ship. Finished closer to final size, there's much less wasted metal to wind up as chips on the floor of your shop. Allegheny Ludlum Potomac M die blocks are delivered to you free from scale and decarburized surface areas, and ready for your diemakers.

3702-3

AVAILABILITY

Allegheny Ludlum's Potomac M is part of the Steelector Program, a unique system which enables tool steel buyers to select the proper steel on the basis of intended application, and check on the availability of the desired size and shape before any purchase decision is made or any paperwork issued. Individual Data Stock Lists for each Steelector Grade clearly set forth the size and shapes of bars and billets available from stock . . . sizes which will serve the requirements of all users. This is all finished stock . . . over 320,000 pounds of Potomac M . . . on the shelf, ready for you. And, it's backed up by over 180,000 pounds of Potomac M billet stock, ready at the mill for finishing to your specifications, should the size, weight or shape of your order take it out of depot stock category. To learn how you can take advantage of this special stocking plan on tool and die steels, contact your local A-L Representative, and ask him about the Steelector Program and the job-shop availability of special sizes, or write Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.

Back-up stocks of ingots and billets insure job-shop delivery schedules on mill shipments. Here, Potomac M billet stocks at the Dunkirk Plant of Allegheny Ludlum await finishing operations.

A corner of an Allegheny Ludlum Warehouse, with part of the finished stocks of large Potomac M die blocks that permit customers to quote on short delivery jobs without expensive inventories.

STEELECTOR PROGRAM

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country

5703-4

Circle No. 4 on Reader Service Card

Why the DIE CASTER

talks D-M-E STANDARD UNIT DIES to the Die Designer and Die Maker

Changeover time goes down ...Profits on short runs go up!

Die changes on zinc or aluminum castings which normally take 3 to 5 hours are now done in minutes with D-M-E Standard Unit Dies.

D-M-E Replacement Units are fully interchangeable: Quickly and easily they're taken out and replaced in the Unit Holder . . . production is continued immediately!

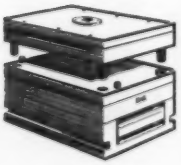
Because several jobs can run on one machine, you increase profits on short run jobs. What's more, you get the quality, the performance and the standardization of replacement parts needed for volume production work.

DIE CASTERS, DESIGNERS AND DIE MAKERS GET MORE FROM D-M-E!

• AVAILABILITY: D-M-E Replacement Units are carried in stock at your local D-M-E Branch for quick delivery. • VARIETY: D-M-E Replacement Units are available in your choice of steel and hardness. • UTILITY: D-M-E has a Standard Unit Die to fit your machine, whether you require rack and pinion or automatic "bumper-type" ejection. • FLEXIBILITY: Complete freedom on three sides of the cavity for core or cooling line placement; six leader pins and bushings for accurate alignment; "quick change" wedge clamps for positive plate positioning. • Start increasing profits on your short-run jobs with D-M-E Standard Unit Dies!

Write for your free copy of *Lower Die Cost Through Standardization.*

61-A-DC



DME

DETROIT MOLD ENGINEERING COMPANY

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D-M-E of Canada, Inc., Toronto

Injection and Compression Mold Bases • Injection Unit Molds • Cavity Retainer Sets • Mold Plates • Ejector and Core Pins
Ejector Sleeves • Leader Pins and Bushings • Sprue Bushings • Moldmakers' Tools and Supplies

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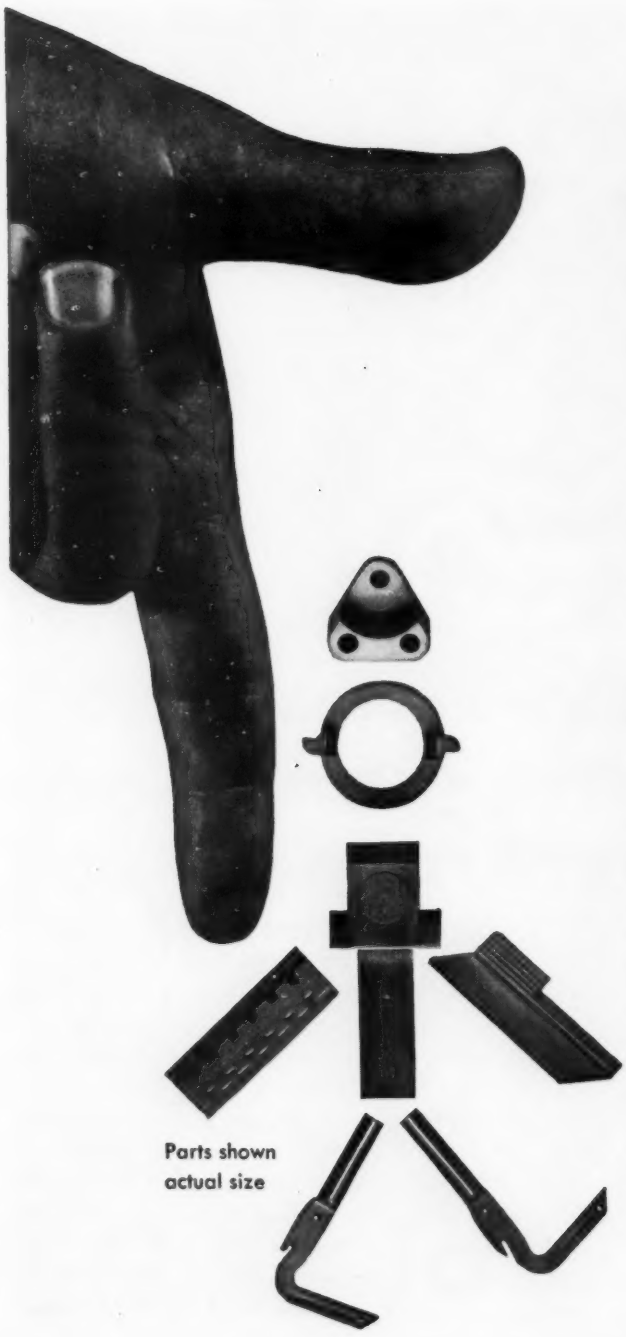
V-R INVESTMENT CASTINGS



Parts shown actual size

in metals that meet your specific needs

- Resist abrasion
- Resist corrosion
- Resist temperature extremes
- Withstand shock
- Non-magnetic

Do your small parts require any of these characteristics? V-R Investment Castings in alloys such as Tantung, cobalt and nickel base metals, stainless steels, beryllium coppers and copper base or silicon bronzes are readily available. Other alloys, with specific physicals, can be developed and cast to meet your requirements. Irregular shapes, unusual contours and exacting detail on internal and external surfaces are accurately and economically produced. V-R Investment Castings are the practical answer to many of your small parts designing problems. Write for complete information today.
VASCOLOY-RAMET CORPORATION,
874 Market Street, Waukegan, Illinois.

The outstanding properties of Tantung are also available in larger parts produced by other casting methods.

V-R FIRST CHOICE of more and more designers

I-850

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PMM

news of industry & associations *activities of people, companies & groups in the precision metal molding industries*

promotions & changes

Hoeganaes Sponge Iron Corp.—*Borje Brandstedt* has been appointed specialty service engineer and will service the cutting and scarfing industry.

Hevi-Duty Electric Co.—*Robert E. Morken* has been named product manager in charge of melting and furnace engineering and sales. His appointment has been made as a result of the addition of a new line of low-frequency induction furnaces.

The Ladendorf Co.—*Joseph D. Stank* has been elected vice president. He was previously sales engineer for the firm, which represents Casting Engineers in the Detroit area.

The Bunting Brass & Bronze Co.—*Elmer T. Blackney* has been appointed to take charge of the firm's new precision plating department.

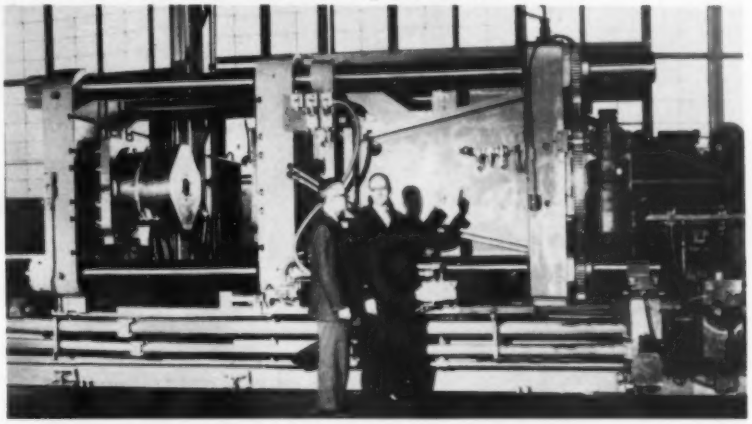
Macklin Co.—*Malcolm Hunt* has been promoted to the newly created post of assistant to the president. *Jack Arnst* will fill Mr. Hunt's former position as vice president and director of sales.

Fansteel Metallurgical Corp.—*John G. Norris* has been appointed to the newly created position of assistant to the president.

Midland-Ross Corp.—*Harry J. Bolwell* has been elected vice president and general manager of the Surface Combustion Division. He was previously general manager of the Chattanooga Division of Combustion Engineering, Inc.

more on page 28

Kux builds mammoth die casting machines



Kux Machine Co. recently shipped several die casting machines which are claimed to be among the largest ever built. Rated at 1300 tons of die locking force, this equipment withstood 1600 tons pressure under the standard strain gauge test approved by the Society of Die Casting Engineers.

These huge machines are used for producing gasoline engine blocks, automotive transmission housings, large control cabinets, gear boxes, lawnmower covers, and other large and complex castings.

Among the features incorporated in these machines are a self-contained maintenance-free hydraulic system, a motorized push-button die height mechanism, and automatic lubrication.

Weight of Model HP 1300 is in excess of 150,000 lbs.; die platens are approximately 5½ x 7 ft., and have nearly 5 ft. of die space clearance between the tie bars. It can go through a complete stroke and injection cycle in 11 seconds, casting 60 pounds of molten aluminum per cycle under injection pressure of 12,500 psi.

Reese plans $150,000 building

Ground was broken last month for a new $150,000 plant by Reese Metal Products Corp., on Old Philadelphia Pike near Lancaster, Pa.

The masonry and steel building will have 10,600 square feet of office, manufacturing and garage space. Including a loading dock and parking space, the development will cover five to six acres.

Reese went into production in 1952 at its present location at 537 Howard Ave., Lancaster.

more Industry News on page 69

BRANDSTEDT

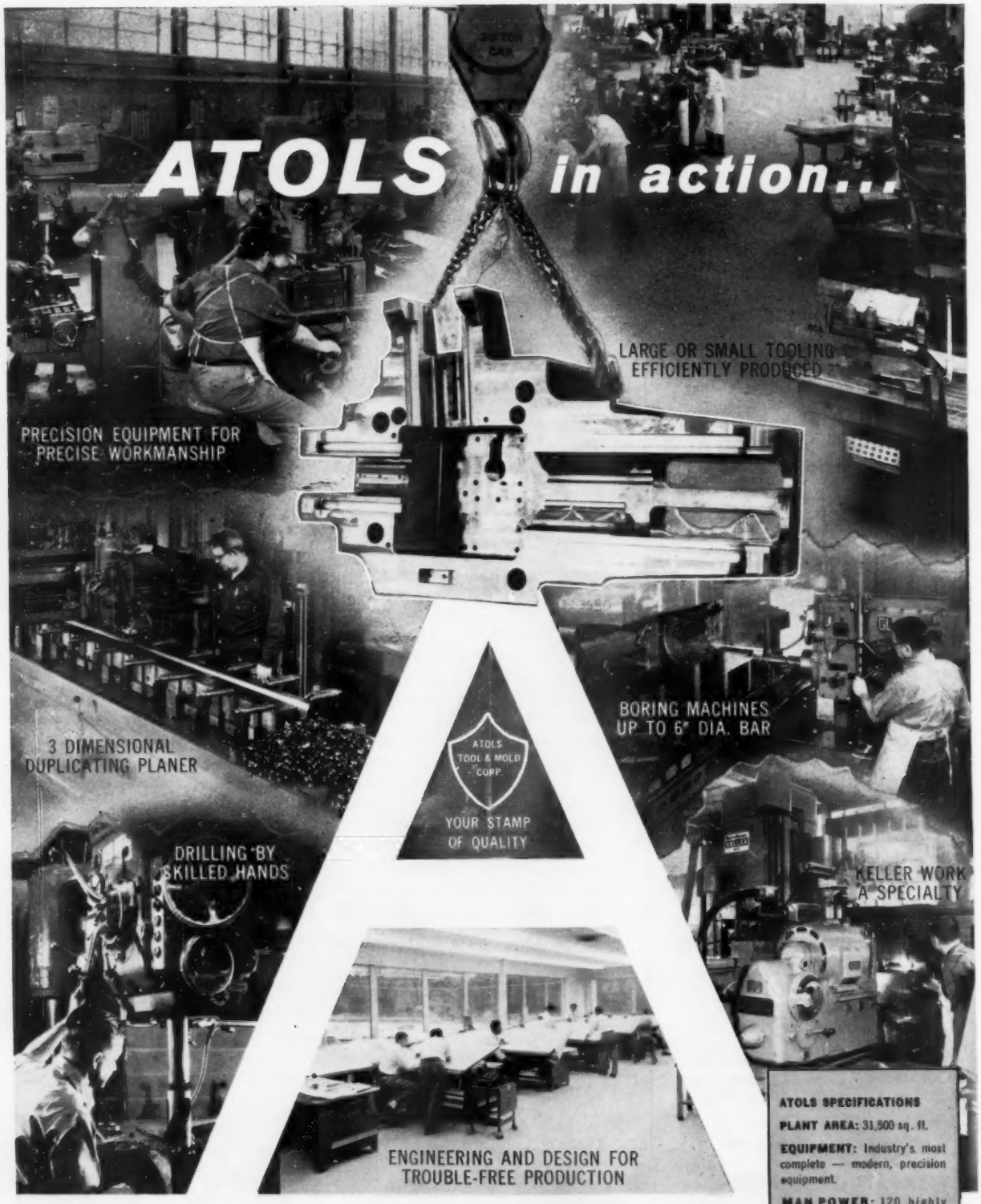
MORKEN

STANK

BLACKNEY

ARNST

HUNT


ATOLS in action...
LARGE OR SMALL TOOLING EFFICIENTLY PRODUCED
PRECISION EQUIPMENT FOR PRECISE WORKMANSHIP
3 DIMENSIONAL DUPLICATING PLANER
BORING MACHINES UP TO 6" DIA. BAR
ATOLS TOOL & MOLD CORP.
YOUR STAMP OF QUALITY
DRILLING BY SKILLED HANDS
KELLER WORK A SPECIALTY
ENGINEERING AND DESIGN FOR TROUBLE-FREE PRODUCTION

A the first letter in our alphabet is also first in many ways. To you it can mean **A**tols is first in Die Casting Dies and mold making . . . first in **A**bility to produce and deliver . . . first in **A**ttention to every detail . . . first in **A**dvanced concepts in mold design and techniques . . . First in your **A**ssurance that your mold or die will produce economically and efficiently. Yes, to you we hope it means—call **A**tols first for any die casting die or mold, regardless of type or size.

ATOLS SPECIFICATIONS

PLANT AREA: 31,500 sq. ft.

EQUIPMENT: Industry's most complete — modern, precision equipment.

MAN POWER: 120 highly skilled specialists in Die Casting Dies and Mold Building.

DESIGN: Engineering facilities from part drawing to approved tooling.

ATOLS TOOL and MOLD CORPORATION • 3828 River Road • Schiller Park, Illinois • NAtional 5-6300

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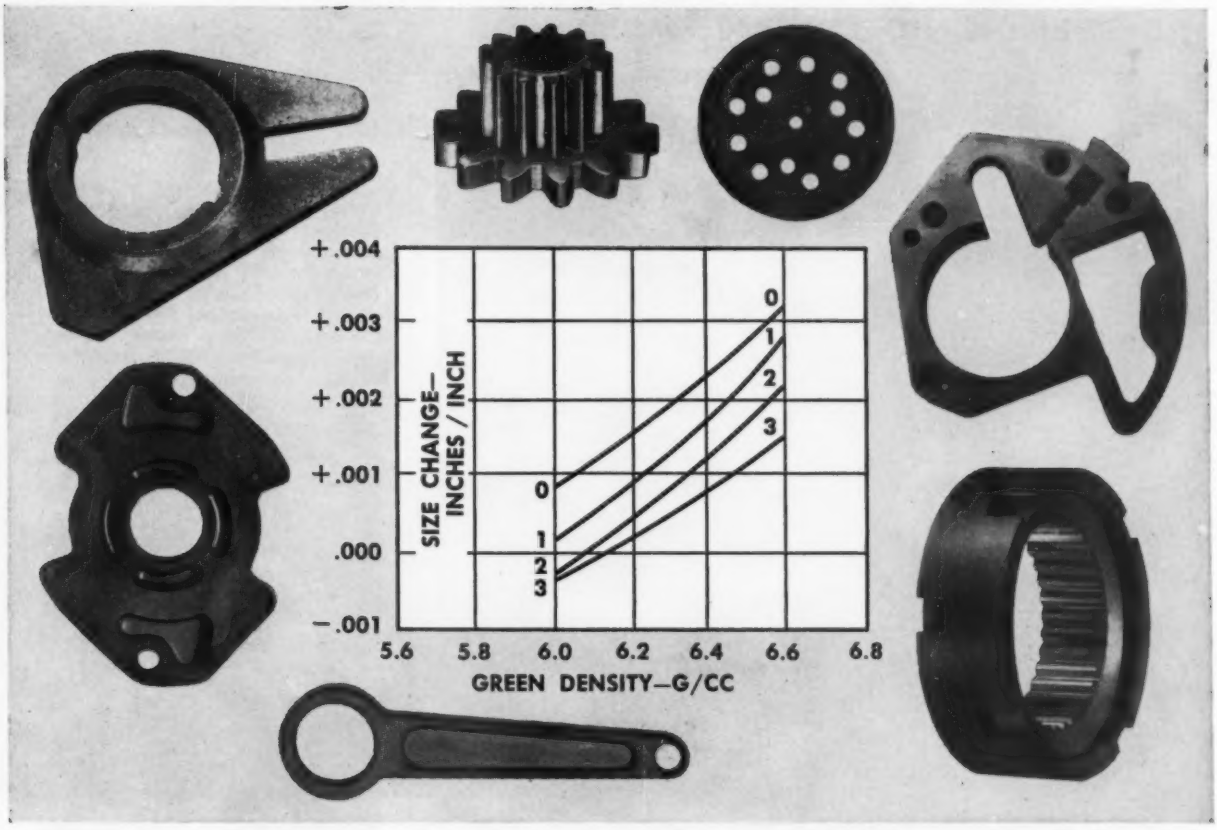


Better dimensional control, with economy ...when you use A.W. Iron Powder

Little differences in the carbon additive to A.W. Iron Powder can make big savings in your plant.

By use of different types of carbon additives, in iron-copper-carbon mixes, a broad range of dimensional control can be achieved. This provides not only greater latitude in design specifications, but prolongs the service life of your dies. Together, these advantages result in closer tolerances for your molded parts at reduced production costs.

The curves shown above indicate the range of dimensional change obtainable with various types of carbon. *The cost of all these grades is almost identical.*

The Alan Wood 50-ton-a-day direct reduction plant, backed by years of metallurgical research, offers you the most advanced technology in Iron Powder. Make Alan Wood your Iron Powder headquarters for dependable uniformity and delivery, as well as technical advisory service.

ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

FOR MORE INFORMATION

IRON POWDER DIVISION
ALAN WOOD STEEL COMPANY
Conshohocken, Pa.

Please send me A.W. Technical Data Bulletin #3, which gives additional details on copper-carbon additives.

NAME AND TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

AMERICAN STEELMASTERS FOR 135 YEARS

Circle No. 3 on Reader Service Card

DISPERSION QUALITY IS ACHESON

Paint a parking lot with colloidal graphite?

Maybe not practical . . . but very possible. A pound of colloidal graphite contained in Aquadag® is capable of coating a surface area of over half an acre! Under similar circumstances 325 mesh graphite will hardly cover the area of a two car garage. Increased film coverage enables Acheson to supply both quality as well as greater economy in its dispersions. IT'S A MATTER OF COST PER AREA OR APPLICATION RATHER THAN COST PER POUND! Engineering note: Acheson dispersions provide a thinner film which does not affect tolerances . . . a distinct advantage in many industrial applications.

To learn more about the unique advantages of Acheson dispersions as they apply to your lubricating problems, write Dept. PMM111.

ACHESON—First name in solid lubricants for fifty-four years.

ACHESON Colloids Company

PORT HURON, MICHIGAN

A division of Acheson Industries, Inc.

Sales offices in principal cities

Also Acheson Industries (Europe) Ltd. and affiliates, London, England

Circle No. 1 on Reader Service Card

promotions & changes

Continued from page 25

Columbia Tool Steel Co.—*Arthur T. Clarage*, chairman and president, has retired as president, but will continue in his capacity as chairman of the board. *Adolph Joseph Scheid* has been elected to assume the post vacated by Clarage. He was previously assistant to the president. *Adolph J. Scheid, Jr.*, vice president, Technology and Quality Control, has retired.

SCHEID

SCHEID, JR.

CLARAGE

WALKER

Waimet Alloys Co.—*Ralph W. Walker* has been appointed sales engineer. He will handle sales and provide technical assistance on standard and special alloys for investment casting.

Rex Precision Products, Inc.—*Alex J. Clune* has joined the staff and will be active in the development of pattern and ceramic materials and processes for investment and plaster casting.

Roto-Finish Co.—*John R. Strom* has been promoted to vice president, and *Richard D. Taylor* has been appointed marketing manager in charge of

STROM

TAYLOR

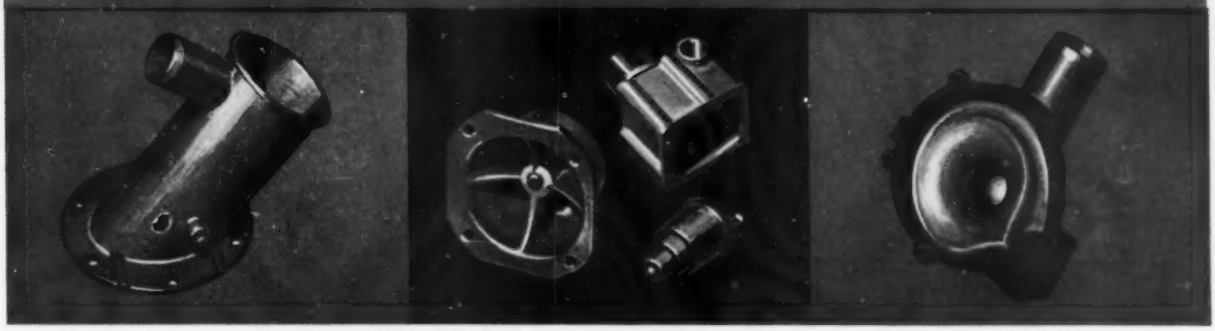
marketing and distribution of metal finishing and cleaning equipment. Mr. Strom has been technical director since 1960.

more on page 68

SPECIFY TADANAC

TADANAC SHG MADE IN CANADA

SPECIAL HIGH GRADE ZINC



Zinc's high strength-to-weight ratio and smooth "as-cast" finish means superior die castings

When zinc is the metal, die cast design can safely include thin sections and still maintain a high degree of strength. Section thicknesses may be varied in the same casting. In addition zinc gives a smooth, pleasing surface for use either "as is" or as a base for bright finishes.

TADANAC Brand Special High Grade Zinc, electrolytically refined under carefully controlled conditions, has the overall purity and the low individual impurity content (determined spectrographically) to ensure it is completely satisfactory for die cast alloy manufacture.

ADEQUATE SUPPLY - UNIFORM QUALITY

Cominco's daily output of over 500 tons of TADANAC Brand zinc assures consistent, prompt delivery of uniform, high quality metal. Let our Technical Service work with you to use TADANAC zinc to your best advantage.

TADANAC SHG *FOR DIE CAST QUALITY*

COMINCO

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED, MONTREAL

Tadanac Brand Metals are sold in United States by American Metal Climax, inc., New York, Chicago, Detroit, Los Angeles

Circle No. **25** on Reader Service Card

For safer, faster diecasting —

EMB Nos 10 & 12A

No fire risk—they're powered by compressed air at 150 lbs./sq. in., controllable by a self-contained hydraulic system—with no slam.

Mechanically interlocked.

Speed of operation—10 shots per minute depending on type of die.

Simple to operate and robust in construction, they can be easily serviced by any good mechanic—there are no electrical gadgets.

Manual control for setting up, automatic for production.

Zinc furnace fired by coal gas, natural gas or oil.

Takes only 2 hours to convert from hot to cold chamber.

MACHINE SIZE	No. 10	No. 12A
Wt. per shot zinc base lbs	2¾	6.3
Wt. per shot aluminum lbs	1¼	2.1
Max. die	16" x 10"	20" x 12½"
Platen stroke	6"	8"

Larger sizes available

E. M. B. Co. Ltd.

WEST BROMWICH • ENGLAND

EMB No. 10 Automatic Diecaster for Zinc

Circle No. 28 on Reader Service Card

Madison-Kipp zinc and aluminum die castings

These five castings assembled in the order that you see them are engineered for a radial arm saw. Intricate in design, they must match perfectly and that means extremely close tolerances. Mass production demands a minimum of secondary operations.

This is just one example of the wide range of castings that Madison-Kipp is called upon to engineer and produce—in quantity. All, however, have one thing in common—the need of a dependable source with years of seasoned experience in producing die castings.

We have a 24-page book showing some of the die casting problems we have solved, and containing information on other Madison-Kipp products. A copy is yours for the asking. Write for one.

kipp

MADISON-KIPP CORPORATION

213 Waubesa Street • Madison 10, Wisconsin, U.S.A.

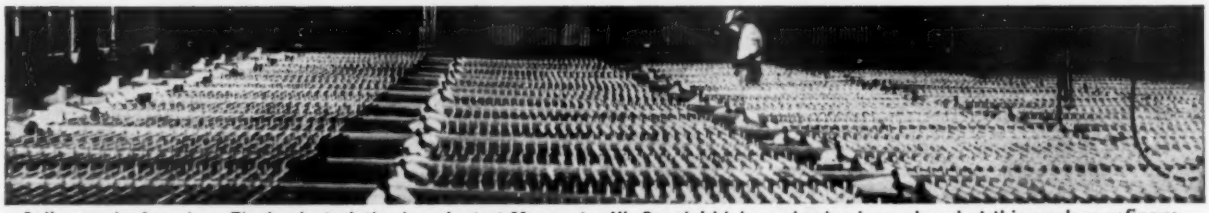
Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High-Speed Air Tools

Circle No. 45 on Reader Service Card

INTEGRATED PRODUCTION—from Ore to Ingot

Underground scene in American Zinc's East Tennessee zinc mines. More than 50 years' reserve of zinc ore has been developed here.

Assures the Uniformity and Purity of



Cell room in American Zinc's electrolytic zinc plant at Monsanto, Ill. Special high-grade zinc is produced at this modern refinery.

AZCO Zinc Die Cast Alloys

Latest spectrographic analyzing equipment is employed to assure accurate control of alloys at all times.

You set your specification—get your specification with AZCO Zinc Die Cast Alloys. AZCO Alloys are produced from American Zinc special high-grade slab zinc—quality controlled from ore to ingot to assure the purity and uniform analysis you need for trouble-free production. From our Monsanto, Illinois, plant in the center of the "Zinc Zone," you get the fast, dependable service you need to meet your production schedules. Phone for immediate attention.

American Zinc sales company

1515 Paul Brown Building, St. Louis 1, Missouri

Distributors for:

AMERICAN ZINC, LEAD AND SMELTING COMPANY

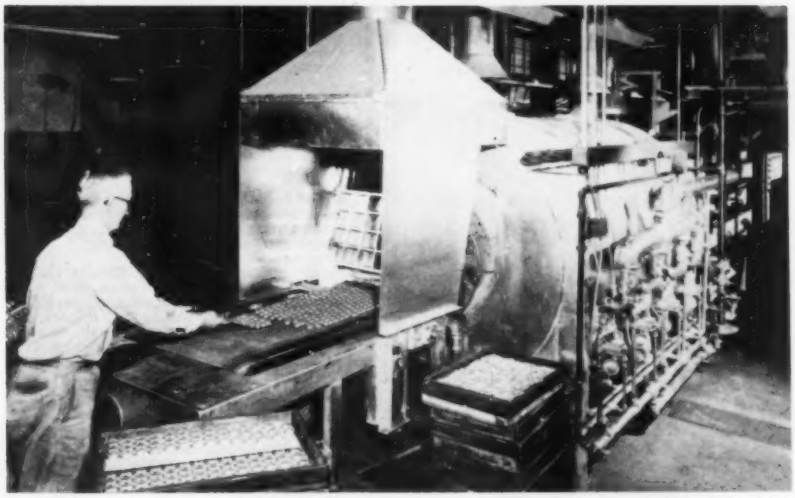
Detroit • Columbus, O. • Chicago • St. Louis • New York

Circle No. 9 on Reader Service Card

PMM

new products & developments *qualified readers can get complete details on these products. Use the reader service cards.*

Mesh belt sintering and infiltrating furnaces



HARPER ELECTRIC FURNACE CORP.—A new 17-model line of sintering furnaces, designed specifically for sintering and infiltrating, includes several unique features for positive counterflow of atmosphere gas, proper disposal of volatiles, easy ash removal, quick duplication of belt speeds, and accurate control of temperature profile.

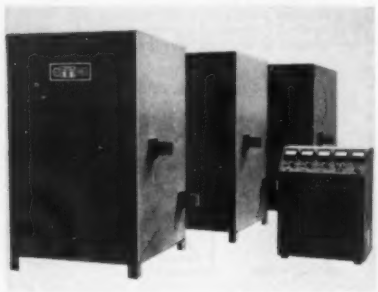
After being placed on the mesh belt, green compacts move successively through a volatile burnoff chamber, a volatile-vent chamber, a high heat chamber, and a water-jacketed cooling chamber.

According to the manufacturer, operating characteristics insure dimensional stability and part strength. Strains within the pressed compacts are relieved gradually since the parts are heated slowly and soaked at uniform temperature in the burnoff chamber for effective volatilization of lubricants.

Circle No. **235** on Reader Service Card

Automatically controlled silicone rectifiers

HANSON-VAN WINKLE-MUNNING CO.—A completely new line of automatically controlled silicon rectifiers for high current, low voltage applications such as anodizing and plating, electrochemical uses, and electrochemical machining features a transistorized control package.



The package includes a silicon controlled rectifier and provides either automatic current or voltage stabilization. This means complete, automatic control of the rectifier output for any possible application.

Since it is a one-unit, packaged control system, it can be removed and replaced in several minutes.

Circle No. **237** on Reader Service Card

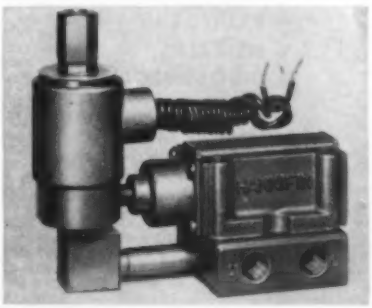
Electroless nickel plating bath

ENTONE, INC., DIV. OF AMERICAN SMELTING & REFINING CO.—Enplate Ni-410 chemical nickel plating bath deposits a uniformly thick, hard, corrosion-resistant nickel plate without the use of electric current. It will deposit electroless nickel by chemical reduction on aluminum and other metal substrates, in addition to plastics, glass, rubber, and many other non-conductors. The nickel-phosphorous alloy deposit is more corrosion resistant than electroplated nickel.

Circle No. **236** on Reader Service Card

Explosion proof solenoid actuators

HANNIFIN CO., DIV. OF PARKER-HANNIFIN CORP.—A new line of explosion proof solenoid actuators for use in hazardous locations has been made available for Hannifin Series "CC" pilot-operated air valves. The



new actuators are suitable for Class 1, Group D and Class 2, Groups F and G hazardous applications. They are offered for both momentary and maintained contact, pilot-operated air control valves.

The explosion-proof valves feature compact design, leakproof construction and large air flow.

Circle No. **238** on Reader Service Card

more on next page

"TIFFIN POTS LAST LONGER"

This is a report that we continue to receive from our customers.

Standard melting kettles and machine pots direct from stock are available for all non-ferrous metals.

Special pots are made to your specifications.

We also furnish the following parts in Tiffin alloyd iron or alloyd steel:

- PLUNGERS
- NOZZLES
- GOOSENECK NOSES
- THERMO COUPLES
- INGOT MOLDS
- BAR STOCK

All parts are especially engineered to give the best possible service in the die casting field.

OVER 50 YEARS EXPERIENCE in the manufacture of quality pots and die equipment.

FREE BROCHURE lists stock pots.

Be Thrifty — Be Wise
Use The Best . . .

THE TIFFIN FOUNDRY, INC.
Phone: Gibson 7-3991
TIFFIN, OHIO
Circle No. **72** on Reader Service Card

new products & developments

Continued

Hinged-steel conveyor belt

MAY-FRAN MANUFACTURING CO.—A new line of patented, flat-top, hinged-steel conveyor belts for handling bulky, hot, or heavy materials and assemblies features a patented link design which permits construction of a flat conveyor surface for above- or flush-with-floor

installations. The belting can negotiate convex or concave curves with safety, and can be supplied to any width from 12 to 60 inches.

Circle No. **239** on Reader Service Card

Tapping and cutting solution

THE TOOLMAN CO.—"Magna-Cut" is designed to aid in precision tapping, reaming, drilling, boring, profiling and many other precision machine jobs. This solution was developed as a cutting solution for magnesium, aluminum and most of the plastics. It is designed to give better tapping action with improved finish, longer tool life, and freedom from gauling and seizing. The solution is nonflammable and has no toxic odors.

Circle No. **240** on Reader Service Card

more New Products on page 78

ADCI DIE CASTERS

ADCI MEMBERS

A & A Die Casting Co., Gardena, Calif.
Ability Die Casting Co., Chicago, Ill.
Advance Pressure Castings Corp., Denville, New Jersey
Advance Tool & Die Casting Co., Milwaukee, Wisconsin
Allen-Stevens Corp., Woodside, N. Y.
Alloy Die Casting Co., Los Angeles, Calif.
Aluminum Company of America, Edison, N. J.
Aluminum Company of America, Bellwood, Ill.
Aluminum Die Casting Co., Los Angeles, Calif.
Ambrit Industries, Inc., Glendale, Calif.
American Aluminum Casting Co., Irvington, N. J.
Anderson Die Casting & Engrg. Co., Div. Mission-West Manufacturing Co., Los Angeles, Calif.
Atlas Die Casting Co., Germantown, Ohio
Badger Die Casting Corp., Milwaukee, Wisc.
Blue Ridge Pressure Castings, Inc., Lehighton, Pa.
Briel Industries, Inc., Shelbyville, Ky.
Callen Manufacturing Corp., Maywood, Ill.
Cast-O-Matic Corp., Syracuse, N. Y.
Central Die Casting & Mfg. Co., Inc., Chicago, Ill.
Century Die Casting Company, Chicago, Ill.
W. L. Chapman Co., Inc., Pasadena, Calif.
Char-Lynn Company, Minneapolis, Minnesota
Chicago White Metal Casting Inc., Chicago, Ill.
Cincinnati Die Casting Co., Cincinnati, Ohio
Commercial Die Casting Co., Los Angeles, Calif.
Congress Drives Division, Tann Corp. Detroit, Mich.
Conneaut Die Casting Co., Conneaut, Ohio
DeCardy Bros. Co., Chicago, Ill.
Delta Die Casting Corp., Schiller Park, Ill.
Diecast Corporation, Jackson, Mich.
Die Cast Products, Inc., Gardena, Calif.
Doehler-Jarvis Division of National Lead Co., Batavia, N. Y.
Doehler-Jarvis Division of National Lead Co., Grand Rapids, Mich.
Doehler-Jarvis Division of National Lead Co., Pottstown, Pa.
Doehler-Jarvis Division of National Lead Co., Toledo, Ohio
Dollin Div. of Precision Castings Co., A Division of Fulton Industries, Inc., Irvington, N. J.
Dow Metal Products Co., Div. of The Dow Chemical Company, Midland, Mich.
Du-Wel Aluminum Products, Inc., Dowagiac, Mich.
Du-Wel Metal Products, Inc., Bangor, Mich.
El Monte Tool & Die Casting, Inc., El Monte, Calif.
Falconer Metal Specialties Co., Inc., Lakewood, N. Y.
Federal Die Casting Company, Chicago, Ill.
Future Products Co., Portland, Ore.
Globe Imperial Co., Division of Harsco Corporation, Rockford, Ill.
Grand Die Casting, Inc., Elmwood Park, Ill.
C. M. Grey Industries, Inc., East Orange, N. J.
Gries Reproducer Corp., New Rochelle, N. Y.
Hadlock & Temte, Inc., Chicago, Ill.
Hamilton Diecasting Corporation, New Hyde Park, N. Y.
Harbat Die Casting Corporation, Nutley, N. J.
Hartzell Mfg., Inc., St. Paul, Minn.
Harvill Corporation, Compton, Calif.
Haug Die Casting Corp., Roselle, N. J.
Heick Die Casting Corp., Chicago, Ill.
Hilfinger Corporation, Toledo, Ohio
Hoover Company, North Canton, Ohio
Hyatt Die Casting & Engrg. Corp., El Segundo, Calif.
Industrial Die Casting Co., Chicago, Ill.
Irrigation Equipment Company, Inc., Industrial Division, Eugene, Ore.

(List Continued on Next Page)

DIE CASTING RESEARCH FOUNDATION PARTICIPANT

DIE CASTING BUYERS:

ELIMINATE GUESSWORK FROM YOUR DIE CASTING COST ESTIMATES — GET BIDS TAILORED TO YOUR REQUIREMENTS

Read the feature article in these pages on the new procedure established by ADCI to help you to obtain sound die casting quotations pinpointed to the requirements of your product. That is the purpose of a new ADCI Product Standard and Product Requirements Information Sheet.

Obtain a supply of the new ADCI Product Requirements Information Sheet from any die caster listed here and you will have a simple but effective means of conveying the exact requirements of each die casting you are planning to buy. In this way you will obtain more accurate cost estimates and the die castings you receive will be tailored to your selected quality level.

Eliminate guesswork from your die casting cost estimates. Make sure that each die casting you specify is exactly what you need and that you pay for exactly what you get. Use the new ADCI Product Requirements Information Sheet.

Remember, too, that ADCI member companies are pledged to the highest standards of business ethics and are equipped to help you in arriving at a die casting design and an alloy selection which will fill your requirements AT THE MOST ECONOMIC LEVEL OF PRODUCTION.

LOOK FOR THIS SYMBOL WHEN SELECTING YOUR DIE CASTING SUPPLIER

ADCI DIE CASTERS

ADCI MEMBERS

Jersey Plastic & Die Casting Co., Irvington, N. J.
Jet Die Casting Corp., Chicago, Ill.
Kentucky Die Casting Corp., Georgetown, Ky.
Kiowa Corporation, Marshalltown, Iowa
Paul Krone Die Casting Co., Chicago, Ill.
Lansco Die Casting Co., El Monte, Calif.
Latrobe Die Casting Co., Latrobe, Pa.
Lester Castings, Inc., Bedford Heights, Ohio
Litemetal Dicast, Inc., Jackson, Mich.
Los Angeles Die Casting Company, Los Angeles, Calif.
Madison-Kipp Corporation, Madison, Wisc.
L. E. Mason Co., Boston, Mass.
Midwest Die Casting Company, Milwaukee, Wisc.
Milwaukee Die Casting Company, Milwaukee, Wisc.
Modern Die Casting Corp., Chicago, Ill.
Monarch Aluminum Mfg. Co., Cleveland, Ohio
Mt. Vernon Die Casting Corporation, Stamford, Conn.
Nelson Metal Products Div., Midland-Ross Corporation Grand Rapids, Mich.
New Products Corporation, Benton Harber, Mich.
Newton Industries, Inc., West Haven, Conn.
Newton-New Haven Co., New Haven, Conn.
Oswego Casting Corp., Oswego, N. Y.
Pabcast, Gardena, Calif.
Paragon Die Casting Company, Chicago, Ill.
Paramount Die Casting Co., St. Joseph, Mich.
Paramount Die Casting Co., Seymour, Indiana
Parker White Metal Co., Fairview, Pa.
Peat Mfg. Co., Div. of Textron, Inc., Norwalk, Calif.
Peerless Die Casting Div. of Peerless Aluminum Foundry Co., Inc., Bridgeport, Conn.
Phoenix Die Casting Co., Buffalo, N. Y.
Pioneer Diecasters, Inc., Los Angeles, Calif.
Pittsburgh Die & Casting Co., Pittsburgh, Pa.
Precision Castings Company, A Division of Fulton Industries, Inc., Cleveland, Ohio
Precision Castings Company, A Division of Fulton Industries, Inc., Fayetteville, N. Y.
Pressure Castings, Inc., Cleveland, Ohio
Production Die Casting Company, Houston, Texas
Quad-City Die Casting Co., Moline, Ill.
Rangers Die Casting Co., Lynwood, Calif.
Republic Die Casting Division, Landers, Frary & Clark, Ft. Smith, Ark.
S.K.S. Die Casting Company, Berkeley, Calif.
St. Louis Diecasting Corporation, St. Louis, Mo.
St. Louis Diecasting Corp. of Keokuk, Keokuk, Iowa
Sherman Pressure Casting Corp., New York, N. Y.
Southern Die Casting & Engineering, High Point, North Carolina
Springfield Die Casting Co., Inc., Kenilworth, N. J.
Stella Products Corp., Livingston, N. J.
Sterling Die Casting Co., Inc., Brooklyn, N. Y.
Stroh Die Casting Co., Inc., Milwaukee, Wisc.
Superior Die Casting Co., Cleveland, Ohio
Techni-Cast Corp., Hamilton, Ohio
Titan Metal Manufacturing Co., Division of Cerro Corp., Bellefonte, Pa.
Twin City Die Castings Company, Minneapolis, Minn.
Union Die Casting Company, Whittier, Calif.
Universal Die Casting Company, Los Angeles, Calif.
Watchung Die Casting Corp., Plainfield, N. J.
Wells Die Casting Co., San Francisco, Calif.
Western Die Casting Company, Emeryville, Calif.
West Irving Die Casting Co., Bensenville, Ill.
Westland Die Casting, Inc., Glendale, Calif.
Wheaton Die Casting Corp., Millville, N. J.
Withrow Die Casting Co., No. Hollywood, Calif.
Yoder Die Casting Corp., Dayton, Ohio

(List from Previous Page)

AMERICAN DIE CASTING INSTITUTE, 366 MADISON AVENUE, NEW YORK 17, N. Y.

MUrray Hill 2-2925

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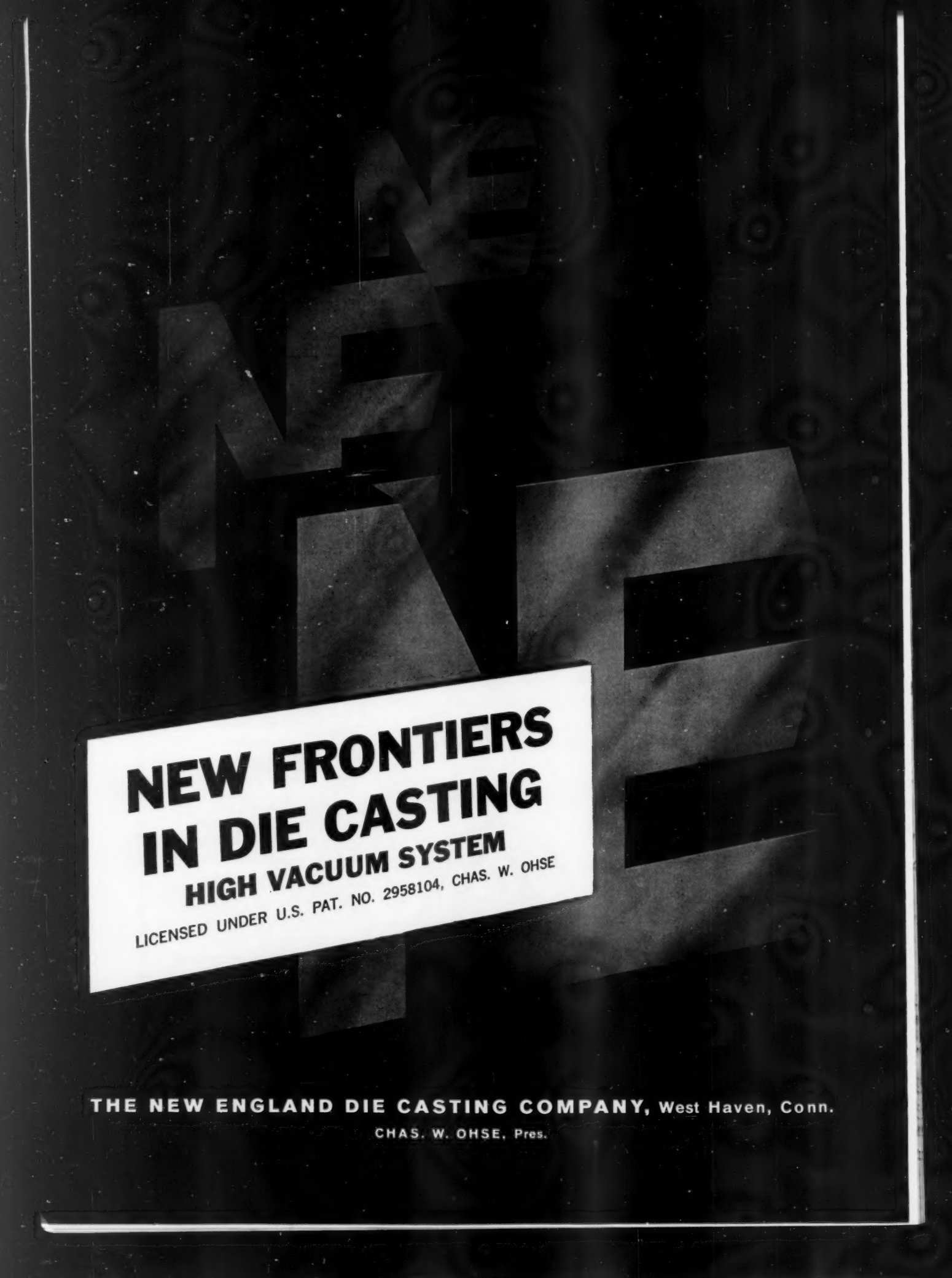
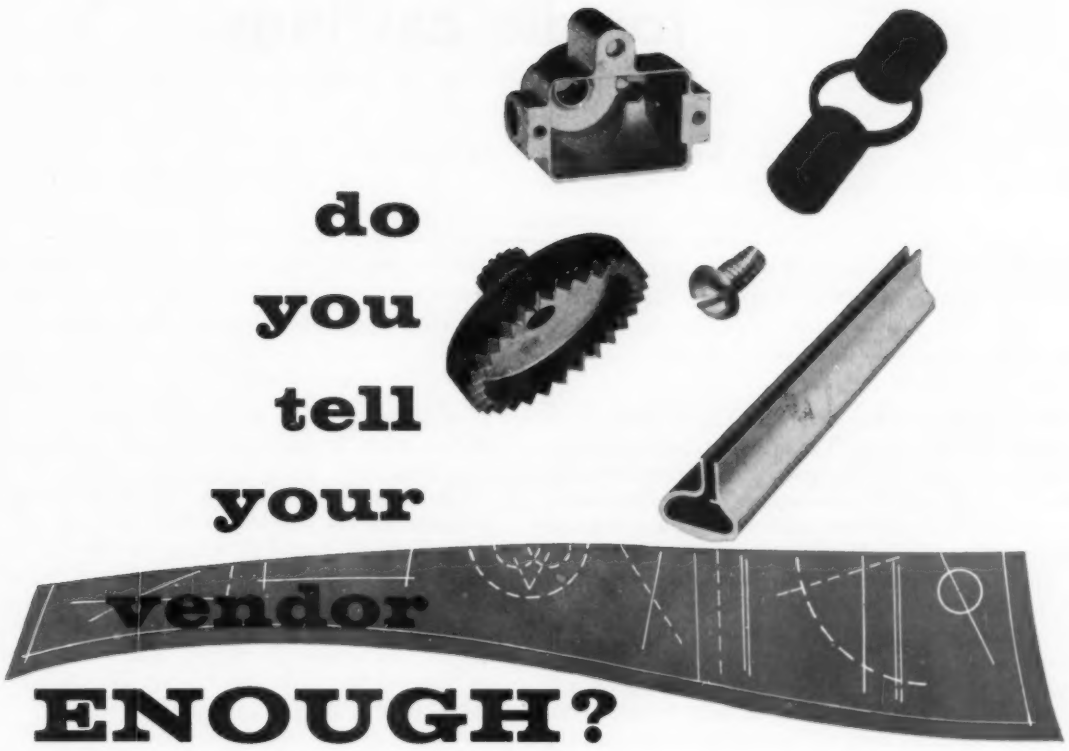

NEW FRONTIERS
IN DIE CASTING
HIGH VACUUM SYSTEM
LICENSED UNDER U.S. PAT. NO. 2958104, CHAS. W. OHSE
THE NEW ENGLAND DIE CASTING COMPANY, West Haven, Conn.
CHAS. W. OHSE, Pres.

Precision
Metal Molding
NOVEMBER 1961



do you tell your vendor ENOUGH?

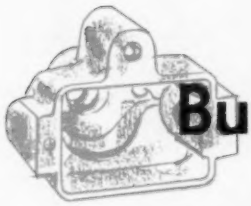
WHAT DO YOU DO when bids on a part come in which are so different it seems doubtful if the vendors are bidding on the same part?

One thing you should do is to look at the specifications that went out with your requests for quotation. DID YOU TELL YOUR VENDOR ENOUGH? Are your files bulging with correspondence from prospective vendors asking did you mean this or did you mean that? Have you bought from a low bidder only to find that he didn't understand just what you wanted?

To help you get bids which can be honestly and accurately evaluated we are giving you the suggestions of the trade associations in the Precision Metal Molding fields. These suggestions for amount and kind of information needed to give an intelligent bid are the concensus of each industry.

But simply getting the information into the hands of possible vendors is not enough. You have to have adequate vendor rating systems in your own company. That's why we have included an article on purchasing policy as practiced at American Motors Corp., a company whose basic philosophy is to always buy components from experts rather than to compete with them.

Finally, we believe that a knowledgeable value analysis is absolutely essential to the proper selection of both materials and processes. In one article we show how Lockheed Aircraft and some subcontractors have saved millions of dollars through the use of value analysis. In the second article we show how value analysis must be carried through every step of manufacture and into the field. This article is illustrated by the case of thread cutting screws on page 63.



Buying practices for die castings

By **L. E. CAPEK,** *ADCI Marketing Committee*

SEVERAL YEARS AGO the American Die Casting Institute issued the first of its "Product Standards For Die Castings" as a guide for designers and engineers to the most economical use of die castings. These Standards now include an Engineering (E) Series on details of design requirements, a Metallurgical (M) Series covering alloy compositions and mechanical properties and a Commercial (C) Series on provisions specific to die casting purchase orders and contracts.

After studying the reasons for inconsistencies and misunderstandings when the cost of die castings are estimated, the ADCI has added a new Standard to its C Series (ADCI-C9-61). This provides die casting buyers with a check list of product requirements and enables die casting suppliers to establish a common basis of quotation.

The ADCI directed its marketing committee to set up a procedure so that die casting buyers could request quotations on a basis which would reflect truly the requirements of each die casting. Such a procedure would benefit both buyer and vendor since it would eliminate much of the guesswork and both parties would understand exactly what each quotation covered.

Many part prints submitted for quotation are accompanied only by brief letters of transmittal. Vendors are often forced to ask for more specific information or to make some long guesses which may or may not be accurate. This lack of information often accounts for the wide spread between the high and the low quotations. Generally, the very low bids are the result of inexact statement of customer requirements. When such bids are accepted, both the buyer and vendor are unhappy with the results.

The marketing committee reviewed product requirement data sheets used by a number of die casters. They found that when these data sheets were filled in by the buyer, the result was a list of product requirement characteristics not normally given on dimensional drawings. The final sheet catalogued ten major requirements, each with three classes. This gave a surprisingly accurately production cost and selling price. In addition, there were fewer misunderstandings.

The new ADCI Product Standard reflects a combination of the most effective portions of existing data sheets. It should go a long way toward improving the relationships between buyers and sellers of die castings. It will result in more simplified, yet complete transmittal of all information essential to sound die casting quotations. It should also assure satisfaction to both buyer and vendor when a die casting goes into actual production.

Any member company of the American Die Casting Institute can furnish customers with the new Product Standard and with information sheets based on the standard which can be used to accompany prints submitted for quotation. One of the ADCI information sheets is reproduced on the opposite page.

The classes under each requirement indicate:

1. The most economical basis of production
2. additional work which may affect cost
3. additional work and special requirements which increase cost

The buyer can also show the checked requirements on part prints by coding with the applicable requirement numbers such as A1, B2, C1, etc. Thus the print and the accompanying information sheet will provide the vendor with all details affecting production cost.

Requirement A, Surface Condition

Class 1 would permit the die casting to be shipped without any particular emphasis (or expense) for cleaning beyond normal practice in the die casting industry.

Class 2, described as "shop run", calls for die castings cleaner than 1. Manufacturing precautions must be taken to avoid an oil residue, yet the parts need not be degreased or involve any specific operation or surface cleaning cost. Parts like this are

PRODUCT STANDARDS FOR DIE CASTINGS

PRODUCT REQUIREMENTS INFORMATION

Supplemental data to details on print, for use in establishing basis of quotation.

(Reference — ADCI Standard C-9)

Customer's Name _____ Individual _____

Address _____
(Street) (City) (Zone) (State)

Prints attached — ☐ yes, ☐ no. Part name and number _____

Is part in present production?—☐ yes, ☐ no. Sample available?—☐ yes, ☐ no. If not _____
ESTIMATED WEIGHT

Anticipated total order _____ Quantity per release _____

Anticipated annual requirement _____ Daily _____ or weekly _____ requirements

Alloy to be used _____ Estimate due date _____

IN INDICATING YOUR PART REQUIREMENTS BELOW NOTE THAT, THE LOWER THE NUMBER, THE LOWER THE PRODUCTION COST. (THIS INFORMATION MAY ALSO BE INDICATED ON YOUR PRINTS BY CODING WITH THE APPLICABLE REQUIREMENT NUMBERS SUCH AS A1, B2, C1, ETC.)

A. SURFACE CONDITION	☐ 1. Some residue and chips not objectionable. ☐ 2. Shop run — blown reasonable free of chips but not degreased. ☐ 3. Clean, dry and free of chips.
B. CAST SURFACE FINISH	☐ 1. Mechanical Grade — finish is not significant. ☐ 2. Painting Grade — some streaks and chill areas that can be covered with paint. ☐ 3. High Quality — for electroplating, anodizing or other decorative finishing.
C. FLASH REMOVAL Parting Line External Profile	☐ 1. No die trimming — break off gates and overflows and remove flash within ⅛". ☐ 2. Die trimmed — to within approx. 015" of die casting surface (See ADCI Standard E-10). ☐ 3. Hand filed or polished — flush with die casting surface.
D. FLASH REMOVAL Cored Holes	☐ 1. Flash not removed. ☐ 2. Flash trimmed to within .010" of die casting surface. ☐ 3. Flash to be machined.
E. FLASH REMOVAL Ejector Pins	☐ 1. Not removed. (See ADCI Standard E-9). ☐ 2. Crushed or flattened. (See ADCI Standard E-9). ☐ 3. Removed from specific locations.
F. PRESSURE TIGHTNESS	☐ 1. No requirement. ☐ 2. Pressure tight to agreed upon psi. Testing medium _____ ☐ 3. Other arrangements to be agreed upon.
G. FLATNESS	☐ 1. No requirement. ☐ 2. To tolerances shown in ADCI Standard E-5. ☐ 3. Critical — to special requirement.
H. DIMENSIONS	☐ 1. Normal — (As per ADCI Standards). ☐ 2. Semi-Critical — must hold certain specified dimensions. Others as per ADCI Standards. ☐ 3. Critical — must hold all specified dimensions.
I. CUSTOMER'S RECEIVING INSPECTION	☐ 1. No Statistical Quality Control — no unusual inspection requirements. ☐ 2. Statistical Quality Control — AQL's over 2.5%. ☐ 3. Statistical Quality Control — shipment acceptable at AQL of _____%. (2 and 3 above, require details of inspection procedure, with major and minor defects agreed upon)
J. PACKAGING	☐ 1. Not critical — bulk packed. ☐ 2. Layer packed — with separators. ☐ 3. Packed in cell type separators or individually wrapped.
K. SPECIAL REQUIREMENTS	

THIS SHEET PREPARED BY THE AMERICAN DIE CASTING INSTITUTE AS A SERVICE TO THE CUSTOMERS OF ITS MEMBER COMPANIES.

suitable for most functional purposes where they must be reasonably clean, yet not chemically or organically cleaned as for paint finishing, etc.

Class 3 calls for a washing, degreasing or other cleaning operation to be included in the basic cost estimate.

Requirement B, As-Cast Surface Finish

Class 1 is called the mechanical grade and this indicates that the parts will serve a functional purpose. An exceptionally smooth finish is not required and should not be included in the cost estimate.

Class 2 is called the painting grade. Some effort is needed to minimize surface streaks and chilled areas so that the die castings can be covered readily with paint with a minimum of preparation.

Class 3 indicates a high quality, smooth as-cast surface suitable for electroplating, anodizing and other decorative finishing (with proper further preparation).

Requirement C, External Flash Removal

Class 1 covers hand break off of flash, overflows, etc. to within approximately ⅛"; no trim die is used to remove this metal.

Class 2 covers a die trim operation which would then control the flash to within .015" of the surface of the die casting.

Class 3 covers hand filing or abrasive polishing of the parting line approximately flush with the surface of the die casting.

Requirement D, Flash Removal from Cored Holes

Class 1 indicates that it is not necessary to remove the flash in any of the cored holes.

Class 2 indicates that the cored hole flash must be trimmed to within .010" of the surface of the die casting.

Class 3 indicates that the flash should be machined to a specified dimension or otherwise made smooth with the cored hole surface.

Requirement E, Ejector Pin Flash

Class 1 indicates that this is not an important requirement and that ADCI Standard E9 can apply for that die casting.

Class 2 indicates that the flash should be crushed or otherwise flattened as covered in ADCI Standard E9.

Class 3 indicates that the ejector pin flash must be machined or otherwise completely removed from the ejector pins specified.

Requirement F, Pressure Tightness

Class 1, no requirement in this area.

Class 2, a pressure requirement is necessary. The psi must be stated and the testing medium specified so that proper tests can be made.

Class 3 indicates special pressure requirements. They should be spelled out.

Requirement G, General Flatness

Class 1 indicates that there is no more than characteristically normal requirements involved.

Class 2 indicates that ADCI Standard E5 applies and should be controlled accordingly.

Class 3 indicates that there are critical flat areas. These are spelled out in an accompanying explanation or referred to specifically on the dimensional drawing.

Requirement H, Specified Drawing Dimensions

Class 1 calls for dimensions as per ADCI Standards.

Class 2 indicates that there are some dimensions which are more important than others and are accordingly emphasized and must be concentrated upon. The remaining dimensions would be controlled as in class 1.

Class 3 indicates that the part is critical on all dimensions.

Requirement I, Customers Receiving Inspection

Class 1 indicates that no unusual inspection procedures will be employed. The parts can be spot checked and put into production without exceptional precautions being taken.

Class 2 indicates that a statistical form of incoming quality control will be used with an A.Q.L. of over 2.5%.

Class 3 indicates the same as 2 except that a more rigid A.Q.L. is desired.

Requirement J, Packaging

Class 1 indicates that packaging is not an important problem and bulk packaging is acceptable.

Class 2 indicates that more care must be taken and layer packing with separators will be included in the die casting cost estimate.

Class 3 covers cell type packing inferring extreme care to avoid damage in shipment and involving higher costs.

Standards Mean More Accurate Estimates

By using this information sheet a buyer more accurately can convey his product requirements. Accordingly he can get more accurate price estimates from his die casting suppliers. The buyer will also receive shipments of die castings that are tailored to his selected quality level. It is time for the buyer and supplier of die castings to cooperate in the area of predictable product requirements. This is an area that has often been nebulously touched upon and then wrangled out uneconomically and inefficiently. There seems no reason why the buyers of die castings should not cooperate to the fullest extent in transmitting the requested information to their die casting suppliers. The custom die caster will then be able to better satisfy the cooperative buyer.

(Note: Complete die casting standards are available from the American Die Casting Institute, 366 Madison Ave., New York 17, N.Y. Request Series E, M, or C, whichever is required.)

Buying practices for investment castings

By **RICHARD E. GRAY**, *ICI Marketing Committee*

ONE OF THE PROBLEMS faced by purchasers of investment castings is the wide divergence in supposedly competive quotations.

A portion of this difference comes from the different labor rates, overhead factors, and unusual product mixes in the different foundries. This condition can not be altered.

But a surprisingly large portion of the differences come about through loosely drawn specifications as submitted by the buyers. Actually, the foundries were bidding on different end products because of different interpretations of the specifications.

To help eliminate a part, at least, of this misunderstanding the Investment Casting Institute appointed a committee to develop a standard form to be used by the buyer when he requests quotations. The form, as finally adopted, is reproduced on page 42.

For convenience in discussing this form the different items have been numbered 1 through 12.

Items 1, 2 & 3

These items identify the casting which is being quoted.

Item 4

This covers the alloy to be used for this casting. In most cases, this is the alloy requested on the print or in the inquiry. Occasionally, the foundry may make a recommendation for a different alloy. The new alloy may provide a better casting or one of equal quality at a lower cost.

Item 5

The type of quotation being made is clarified here. Sometimes a verbal estimate has been given to a customer and the quotation may confirm it. Occasionally there is insufficient information for the foundry to quote accurately. In this case, the foundry would make the notation that this is an estimate rather than a binding quotation.

Items 6 & 7

In looking at Item 6, the customer can determine the next higher or lower quantity where he can expect to receive a price change. The quantities shown in Item 7 would be those requested by the customer. Based upon the sample quotation form illustrated, the customer may request a quotation for quantities of 1000, 1500, 2000 and 2500 pieces. In accordance with Item 6, the customer can expect the same price for 1000, 1500 and 2000 pieces, and a lower price for 2500 pieces.

Item 8

The price for each casting is listed in conformity with the quantities requested in the customer's inquiry.

Item 9

Tooling costs will vary based upon the quantity of castings required and also the quality requirements and end use of the part. Inexpensive tooling may be quoted for low quantities. High quality, multi-cavity tooling is usually required for large quantities. It is well to keep in mind that the quality of the casting can only be as good as the quality of the tool. Any additional tooling or fixtures required to perform secondary operations on the casting would also be quoted in this item.

Item 10

The customer may require supplementary services which may be shown on the blueprint, listed in his specifications or spelled out on the actual inquiry. The cost of these supplementary services is included in the unit price of the castings. The unit price reflects the actual cost of these services plus the affect they may have on the casting yields. There are varying degrees of testing requirements which would be designated by a check-mark in the appropriate box. These requirements are explained as follows:

Chemistry

The Certified Raw Material Analysis is the actual analysis before casting of the alloy used to produce the parts. This analysis provides the customer with a guarantee that the proper alloy was used to produce his castings.

The Cast Certified Master Heat Analysis is the exact analysis of the part after casting, guaranteeing to the customer that the parts are according to specification and none of the chemical elements have been lost during casting.

Physical Testing

Physical tests for each master heat are practical in many alloys as long as the same lot of raw material is

MEMBER

DATE:

INQUIRY NO.:

We are pleased to submit the following quotation subject to the Investment Casting Institute standard terms and conditions shown on the reverse side, and the notations stated below.

TO

PART NUMBER 1		REVISION NUMBER 3	☐ FORMAL QUOTE ☐ ESTIMATE
PART NAME 2		ALLOY 4	☐ CONFIRMATION 5 Subject to review based upon further clarifying specifications and/or drawings.

6 THE PRICES LISTED BELOW ARE BASED UPON STANDARD PRICE BREAKS AS FOLLOWS: 5, 10, 25, 50, 100, 250, 500, 1000, 2500, 5000, 10000, 25000, 50000.

REQUESTED QUANTITIES	UNIT CASTING PRICE	TOOLING CHARGES
7	8	9

The supplementary services checked below are included in the unit price. 10

Chemistry: ☐ Certified Raw Material Analysis ☐ Cast Certified Master Heat Analysis ☐ Other _____

Physical Testing: ☐ For Each Master Heat ☐ For Each Heat Treat Lot ☐ Other _____

X-Ray: ☐ Foundry Control ☐ 100% ☐ Samples We plan to use _____ views.

Zyglo: ☐ Foundry Control ☐ 100% ☐ Samples ☐ Other _____

Magnaflux: ☐ Foundry Control ☐ 100% ☐ Samples ☐ Other _____

Heat Treatment: _____

Test Bars: _____ Each Bar _____ Per Lot

Secondary Operations ☐ As Noted Below

PLEASE FURNISH ? PRINTS WITH THE ORDER.

REMARKS:

11

DELIVERY: Based upon present schedules. Samples ..... weeks after receipt of order. 12

PRODUCTION ..... weeks after sample approval.

TERMS: .....

BY _____

used. Physical testing for each heat treat lot would apply to many alloys where the physicals must not only test the quality of the cast metal but also the quality of the heat treatment.

X-Ray, Zyglo, Magnaflux

The foundry control of these non-destructive tests would indicate to the customer he is getting a fine quality part. The burden of inspection is on the foundry. The 100% non-destructive tests greatly add to the cost of the casting, but do provide complete control of the casting's quality. The non-destructive testing of samples is often sufficient to prove the quality of subsequent production lots.

Heat Treatment

The type of heat treatment appropriate for the particular casting, or a heat treatment requested by the customer, would be spelled out in this section.

Test Bars

There are many applications for which the customer requires test bars be furnished as a further control on the quality of the casting. These test bars may be sold on a per bar or per lot basis.

Secondary Operations

There are occasions where the investment casting foundry is required to perform secondary operations on the castings. If secondary operations are necessary, this box will be checked. Under remarks, such secondary operations will be further defined.

Item 11

Here the foundry will clearly express those conditions it can or cannot meet out of these which the customer has requested on his print or specifications.

Item 12

Delivery of samples and production is based upon the schedule of the foundry at the time of the quotation. This is furnished as a rough guide for the customer's purchasing and engineering personnel as an aid to proper planning. It must be remembered that the foundry schedule may change between the time of the quotation and the time that the order is actually placed.

The adoption of this standardized form, when a request for quotations is sent out, should eliminate all, or at least a large majority, of the guesses the foundries have had to make. Quotations will represent the real differences in foundry costs and operations. The buyer will then be able to make a more intelligent evaluation of competitive bids.

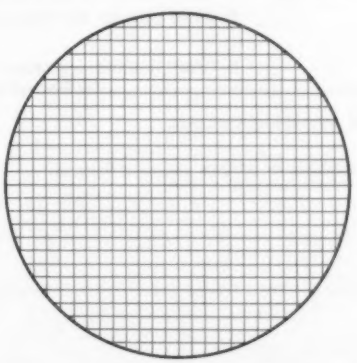
(Note: Copies of the standard form illustrated may be gotten from any member company or from the Investment Casting Institute, 27 East Monroe St., Chicago 3, Ill.)

Buying practices for extrusions

EXTRUDED SHAPES can save you money in both manufacturing and assembly, provided the specifications to the vendor are sufficiently detailed and explicit. To get the greatest saving from an extruded shape you should show your vendor where and how the shape is to be used. He can often combine two or more assembled parts into a single section to give you superior end products.

The parts drawings seldom give all of the information that is needed. What's more, parts drawings are frequently so vague that the vendor must either ask for more information or guess at what the designer really wants.

To help overcome this information gap, two forms are given here. One is for non-ferrous extrusions and is typical of the sort used by the copper and brass extruders. It applies equally well to the extrusions made in aluminum and magnesium. The other form for ferrous extrusions is one used by the Babcock & Wilcox Co. This second form includes a 6½" circle within which your part can be sketched. For most extruders of ferrous metals a 6½" circumscribing circle is the largest that their presses can accomodate.



CIRCLE 6½ inches in diameter is included with information form for ferrous extrusions. Part for which estimate is desired can be sketched inside circle.

QUALITY CONTROL INFORMATION for NON-FERROUS EXTRUDED SHADES

The information below is for Mill Guidance in Producing Materials to Satisfy Requirements.

Customer_____ Date_____

Address_____ Drawing or Part No._____

1 MATERIAL REQUIRED— Brass ☐ Copper ☐ Nickel Silver ☐

2 IS TEMPER AN IMPORTANT FACTOR? Yes ☐ No ☐

3 LENGTHS—(a) Specific or Multiple ☐ (b) Stock Lengths with Ends ☐

4 Are any Cross Section Dimensions, Angles, Radii, Corners, or Contours particularly important?

If "Yes", circle critical points on print with red pencil. Yes ☐ No ☐

5 What is the end use of this shape?

6 If this section is to be used as part of a unit, please submit assembly drawing, picture, or description.

7 Into what length is shape cut for final assembly?

Specify: _____

8 Are special "Go—No Go" gauges used for checking shape? Yes ☐ No ☐

If "Yes", will duplicates be supplied to mill for inspection? Yes ☐ No ☐

9 How is shape processed? Check below and describe below.

Mitered ☐ Bend ☐ Machine ☐ Screw Machine ☐ Weld ☐

Others ☐ Describe:_____

10 SURFACE FINISH—

Is shape polished or plated? Yes ☐ No ☐

Is shape used for electrical contact work? Yes ☐ No ☐

If "Yes", indicate important surface on print.

11 Estimated annual requirements.

12 Special comment re camber, twist, or flatness.

Signed _____

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
BEAVER FALLS, PENNSYLVANIA

INQUIRY INFORMATION FOR STEEL EXTRUSIONS

Customer _____ Inquiry No. _____

Address _____ Dwg. No. _____

Analysis _____

Attention: _____ Spec. _____

Quantity _____ Pieces _____ Lbs. _____

Bar Length Desired _____ Final Cut Length _____

End Use _____

_____

_____

Are there any critical dimensions? _____ Yes (Indicate on Print)
_____ No

Is this for a newly designed part? _____ Yes _____ No _____

If no, how is it now produced? _____

_____

_____

Are design changes possible? _____ Yes (Indicate where, on Print)
_____ No

Additional Information _____

_____

_____

NON-FERROUS EXTRUSIONS

Some of the items on this form should be explained.

Material Required

The designer usually specifies a particular alloy. In many cases the prospective vendor can recommend another material which will give equally good parts at a somewhat lower cost. If no change can be allowed be sure to say so. The same thing applies to temper.

Lengths

If possible allow your vendor some latitude in lengths. Odd shipping lengths which do not cut economically from mill lengths can generate a high scrap loss for which you will have to pay.

Dimensions

Hold tolerances to the standards set by the industries. Closer tolerances increase costs. Copper and copper base alloys, magnesium and magnesium base alloys, and some aluminum alloys can be cold drawn to tolerances closer than as-extruded. The cost is increased by this operation, but often the better accuracy eliminates machining with an over-all manufacturing economy.

Checking & Inspection

Specify the inspection and testing which will determine acceptance from the vendor. Unless you specify otherwise, the quotations will include only routine inspection. More detailed testing will increase costs.

How Is The Shape Processed?

In many cases your vendor has special tooling and set-ups for doing standard jobs. He may be able to fabricate more economically than you can.

Surface Finish

Ordinary mill finish usually shows some longitudinal die marks. If the shape is to be surface finished by plating, polishing, anodizing, or some similar process your vendor may be able to furnish material with an improved surface finish so that your polishing costs are cut. Conversely, if surface finish is of small importance you may be able to get the extrusions at a lower cost.

Camber, Twist, & Flatness

Try to hold camber, twist, or flatness specifications within the standards of the industry. These are the most economical.

FERROUS EXTRUSIONS

Most extruders of ferrous metals, titanium, zirconium, etc. are limited by their press capacity to parts which can be held within a 6½" circumscribing circle. This, of course, means the maximum distance from corner to corner of the shape.

Remember, too, ferrous extrusions can not be made to the same dimensional accuracy as non-ferrous ones. The glass lubricant used to extrude ferrous materials is relatively thick and on complex shapes may not be uniform.

Generally, surface finish on these extrusions is not as good as on non-ferrous shapes. In some cases, a redraw is possible, but the expense involved is considerable and it is only possible on very light sections.

While many parts can be hot extruded to final shape, it is more common to extrude to a semi-finished shape and do the final work by machining methods. The saving in this procedure is, of course, the greatly reduced machining time and metal scrap. Recently, chemical milling has been used to secure final shape and surface. This process is capable of extremely close tolerance work and is applicable to most alloys which can be extruded.

In specifying alloys, remember that a number of alloys have been developed which are particularly well adapted to hot extrusion. However, allow your vendor enough latitude so that a substitute material can be used which extrudes better than the specified alloy.

The different points of information called for on the inquiry sheet are self explanatory. Be sure to give your vendor complete information so that there can be no question as to what you want. Bids from different suppliers can then be evaluated on a fair basis.

Buying practices for powder metallurgy parts

By **R. B. THOMSON,** *Chairman, MPIF Industry Development Committee*

THERE ARE TWO factors peculiar to the powder metallurgy process, its products and materials.

If the user is involved in complicated structural parts—which, incidentally, are ideally suited to the process—he must be prepared to share various design and operational information with his supplier. The degree to which there is such a sharing between user and supplier will be a direct indication of the degree

WORK SHEET

Date_____

The purpose of this sheet is to analyze your maximum and minimum assembly sizes to arrive at the proper extremes of running clearances and with other data requested to arrive at the proper Gramix alloy. If you will fill in this confidential survey sheet as complete as possible we will be in the best position to serve you.

1. Company_____ Your name_____ Title_____

   Address_____ City-State_____

2. Part name_____ Part No._____ Rev._____ Dated_____

   Drawing Sample attached. How part used_____

   _____

   Present material_____ Mating material_____

   Temp. of operation_____F. to _____F. Load_____Lbs. Shock_____RPM_____

   Type-method of lubrication_____

3. Recommended bearing sizes —

   ID_____to_____ OD_____to_____ LG _____to_____

   FL OD_____to_____ FL TH_____to_____ Other_____

4. Recommended housing size_____to_____ Burnish size_____

   Recommended shaft size _____to_____

5. To compute the maximum and minimum variations of your bearing assembly follow the steps listed below:

(From) Low limit OD.....	(From) high limit OD.....
(Subtract) High limit housing.....	(Subtract) Low limit housing.....
MINIMUM INTERFERENCE	MAXIMUM INTERFERENCE .....
(Multiply) minimum interference by 70% — MIN. CLOSE-IN	(Multiply) maximum interference by 70% — MAX. CLOSE-IN .....
(Enter) high limit ID	(Enter) Low limit ID.....
(Subtract) sum of min. close-in plus low limit shaft.....	(Subtract) Sum of max. close-in plus high limit shaft .....
MAXIMUM CLEARANCE.....	MINIMUM CLEARANCE .....
(Enter) low limit ID.....	(Enter) High limit ID.....
(Substract) maximum close-in.....	(Subtract) Min. close-in.....
MIN. ID AFTER ASSEMBLY.....	MAX. ID AFTER ASSEMBLY.....
MIN. CLEARANCE AFTER BURNISH.....	MAX. CLEARANCE AFTER BURNISH.

6. Secondary operations and treatments_____

   _____

7. Production requirements_____quarterly. Present cost_____

8. List all dimensions critical to the parts function_____

   _____

9. Explain how tolerances closer than .001 are inspected (Plug gauge, air gauge, etc.)_____

   _____

10. Drawing(s) of inspection fixture(s) attached.

11. Additional information_____

    _____

    _____

    _____

Signed_____

of success to expect from the final production part.

The user must also realize that, in spite of the good, reliable physical and mechanical property specifications put out by MPIF, ASTM, SAE, and other trade and technical organizations, these specifications for powder metallurgy parts are based entirely on flat test bars. Molding of test bars is very simple and, since there are no design complications, it must be remembered that different physical properties could result if the piece were of a complicated design.

If the varying sectional thicknesses of parts are to be put under stress or shock loading when the part is in use, it is most desirable to set up acceptable qualifying or functional tests. These tests must be agreed upon by both buyer and vendor before production parts are shipped. In fact, these tests should be a part of the purchase agreement since the kind and amount of testing can have a profound effect on the bid price.

The accompanying work sheet will give all prospective vendors sufficient information so that the buyer may be sure that all quotations are on the same part. There will be no guesses and no correspondence about what is meant.

Note that this work sheet includes information for both structural parts and porous bushings.

Items 1, 2, 6, 7, 8, 9, and 10 are self-explanatory. They are most important for the producer to know since they not only define the part precisely, but allow the producer some latitude to suggest possible alternatives.

Items 3, 4, and 5 deal specifically with bushings and are most important if the best possible bushing is to be supplied for the intended service.

Note, also, that this work sheet does not include specifications as to material. In the majority of cases the parts producer is best able to select the material which will give the intended service—his recommendations should be carefully considered and, in most cases, followed. If there are specific service conditions such as magnetic properties, corrosion resistance, required porosity, etc., these should be spelled out completely so that there is no possible area for misunderstanding.

Buying practices at American Motors

By **L. H. SHIPPEE,** *Director of Purchasing*

AMERICAN MOTORS is dedicated to building the finest possible quality into its products. Therefore, no point is too minor to go into in detail with the vendors prior to placing business. We look to our suppliers to keep abreast of new techniques, developments and the like in their fields so that they will assist us to build better products at lower costs to the ultimate consumer. Thus we dare not allow ourselves, or our suppliers to be lax, resulting in inferior quality which ultimately winds up in loss of consumer sales and subsequent loss to us and our suppliers operations. However it must also be borne in mind that competition today does not permit paying any premium or excess cost. The job must be accomplished correctly at the outset.

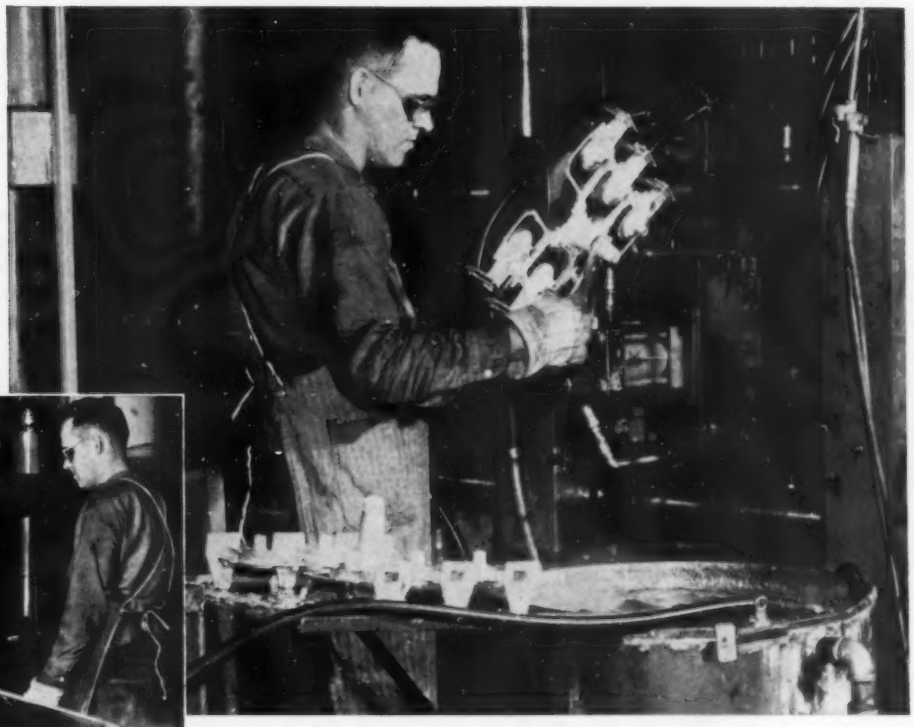
Thus it is only by constant mutual cooperative endeavor on the part of the vendors and ourselves that the ultimate consumer will realize more value for his purchasing dollar tomorrow. This is the only sound way to secure his good will and our future growth.

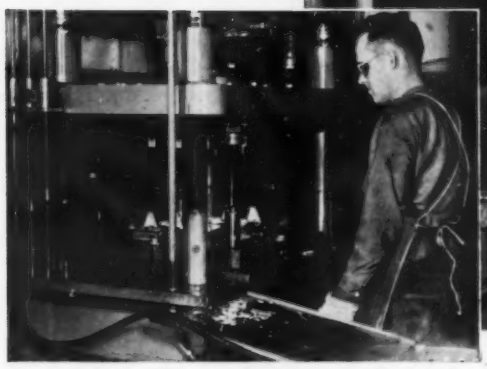
American Motors both manufactures and purchases parts for production use in building its products. The determination of whether a part is to be made or purchased is based on:

1. Plant facilities to economically produce the part to specification.
2. Open capacity in such facilities to adequately meet quantity requirements.

American Motors does not have die casting, powdered metal, extrusion, or chrome plating facilities, thus parts falling into these categories are purchased.

more on page 50



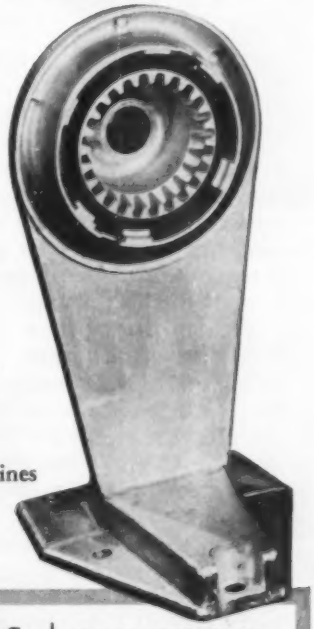


6500 DIE CASTINGS A DAY!

Greenlee-B&T "Production Teammates" combine quality with quantity for Apsco Products, Inc.

"Ace" Fisher, of Apsco's Die Casting Department says: "These Greenlee - B & T machines are the best we have had in the plant."

Greenlee - B & T "Production Teammates" — a 300 ton hot chamber die casting machine and a 28 ton trim press have solved the problems of quality castings in volume quantities for Apsco Products, Inc., Rockford, Illinois. "Hardware" finish, high density die castings, such as the intricate pencil sharpener base shown at right, are produced at a rate of 6500 pieces a day. World leader in the manufacture of pencil sharpening equipment, Apsco maintains high standards in producing sharpeners of rugged construction and functional design. Get acquainted with Greenlee - B & T's "Production Teammates." Write for complete information.



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In selecting a prospective vendor for parts several factors such as corporate history, plant facilities, financial status, customer relations reputation, supplier relationships, labor relations, and the like are taken into consideration prior to sending an inquiry requesting a quotation. These are very important as a prospective vendor must know his whole operations, costs, and industry thoroughly.

If the vendor measures up to the desired status, and it appears that the prospect would be of advantage, an inquiry complete with all specifications is forwarded for quotation purposes.

The vendor's quotation is analyzed on the following points in order of preference:

1. Conforming in all respects to specifications to assure parts meeting the quality standards required.
2. Service of the account, particularly scheduling and production flow of parts and engineering assistance in design and development problems.
3. Warranty of excellent manufacture through process controls to correct any unforeseen detrimental problems which may cause defective parts.
4. Freight and handling or transportation costs.
5. Price of the part, tooling costs, and tooling time to assure the most economical purchase.

It is obvious that business will be placed only with the potential supplier whose quotation measures up to all of the above points. After the buy has been made and the vendor has completed tools, sample parts from the production tools must be approved by our Inspection Department prior to actual vendor production. When sample parts are approved the vendor then is instructed to fabricate parts for production in accord with our release schedules.

Throughout the year, daily inspection reports, notes, and like information are retained. A vendor is rated as to performance and ability for consideration on future buys. Obviously, those vendors that do not have a good rating are dropped from further consideration.

Value analysis can get you more jobs

By **SCHOLER BANGS,** *Western Editor*

CALL IT Value Engineering or Value Analysis.

Uncle Sam uses it to slice millions from the cost of making bits and pieces for guided missiles.

It requires government contractors to survey parts costs and switch to new production methods, including precision casting, if a change will save money without sacrifice of quality.

Value Analysis can become your secret weapon in getting consumer hardware manufacturers, who may have thought it strictly for the "birds" of missiledom, to switch from costly machined parts and assemblies to dollar saving precision castings, extrusions, or powder metallurgy parts.

You can show them by example how it will put profits in their pockets!

One example:

Sperry Phoenix Company, a Sperry Rand Corp. division at Phoenix, Ariz., put a Gyrosyn compass under scrutiny of value analysis. The compass housing had been a costly $23.51 machined item. A value analysis team made up of Manufacturing Engineering, Purchasing and Product Engineering personnel discovered the part could be produced by casting for $13.23, a saving of 44%.

COST of compass housing was cut nearly 44% by application of value analysis.

continued on page 52

BETTER
METAL CASTING WITH
HARBISON-WALKER
REFRACTORY MOLD MATERIALS

H-W Flintgrain for ceramic shell molds

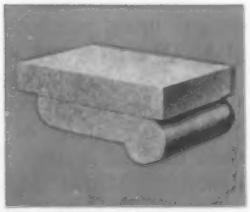
H-W FLINTGRAIN is an alumina-silica product of high refractoriness having very desirable low thermal expansion characteristics.

The angular grain shape and optimum size distribution make H-W FLINTGRAIN ideal for securing maximum compactness in the mold. It is used with special benefit for making ceramic shell molds and for similar applications in which dense, compact mold sections of greatest volume stability at all temperatures are of paramount importance.

Illustration of angulate shape of H-W Flintgrain enlarged x3

H-W Mullite Grains and Flours for precision molding of metals at extremely high temperatures

These H-W Mullite products by virtue of their high-alumina composition and low content of basic oxides are exceedingly refractory. The hard dense grains are strong and most resistant to fluxing. Excellent thermal stability accounts for their unusual constancy of volume up to their temperature limit. The maximum thermal expansion of these mullite products is approximately 0.6 per cent which is less than half that of silica sand. These are the properties which make them especially suitable for precision casting work at high temperatures with particular benefit for various non-ferrous and ferrous alloys.



Illustrated here is a typical two-part mold in H-W Mullite material made for the precision casting of a beryllium-copper alloy.

HARBISON-WALKER REFRACTORIES CO. and subsidiaries

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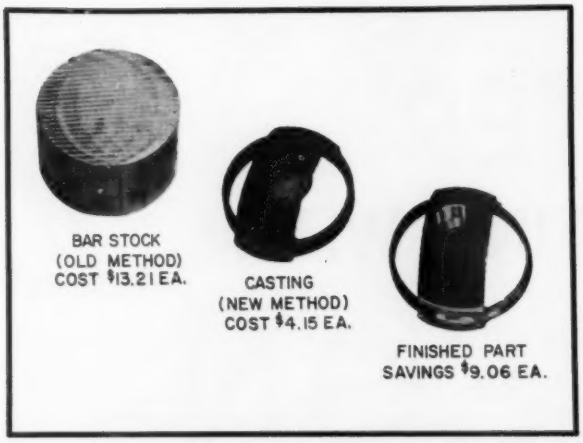


VALUE ANALYSIS is expected to save $25,200 in the production of this cam.

The old machining method of producing the housing involved these costs:

Cutting bar stock into slugs,	$ .50
Hogging out inside,	4.00
Machining outside contour,	4.80
Contour mill flange,	3.04
Fin machining,	11.17
Total	$23.51

Here are the casting method costs for a stainless steel investment, using polystyrene patterns:

Casting	$ 2.06
Fin machining	11.17
Total	$13.23

Another major factor, other than direct cost reduction, clinched the switch to casting. Sperry Phoenix reports that the investment cast housing reduced the reject risk by eliminating some machining operations and minimizing others.

Another example:

At Sunnyvale, Calif., Lockheed Missiles & Space Company, took a hard-boiled value analysis look at a Polaris missile antenna cavity assembled from 28 separate machined parts and 78 sets of bolts, nuts and washers.

Lockheed's value analysis team discovered that the complex antenna cavity could be produced as a single casting which would cut 63 percent from original design manufacturing costs.

Tooling alone for the old-design part costs $26,000 and manufacturing cost per unit was $917. The new design, using precision casting, carried a tooling cost of $8300 and a unit manufacturing cost of $340.

These are not isolated or special examples.

If a prospective customer is hesitant at making a switch to casting, or suspects that examples given show unusual savings, let him read the comment given PRECISION METAL MOLDING by Alfred H. Peterson, manager of Value and Production Engineering for Polaris missile production at Lockheed:

"By applying Value Engineering principles in the early design phase a total of nearly $3,000,000 in cost reduction has been realized this year.

"There is additional potential cost reduction of several million dollars in designs which have been "value engineered" but which are still pending.

"One of the methods which has proved effective in reducing costs has been the substitution of castings for built-up assemblies, such as weldments, hogged out parts and sheet metal assemblies."

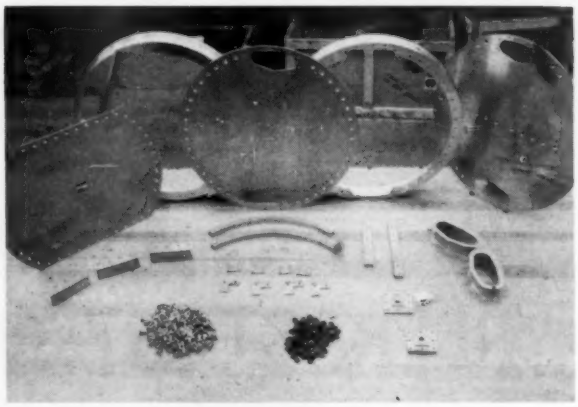
This indicates the variety of metal parts and assemblies that have been and will be subjected to Value Analysis by just one manufacturer.

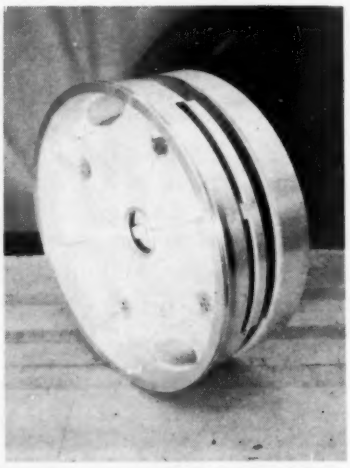
It should indicate to any consumer goods manufacturer that maybe it is time for him to try out the same technique on some of the assemblies which go into his own products.

How do you set up a value analysis program?

Sperry Phoenix Company does it like this:

Personnel for a value analysis team are selected from Engineering, Manufacturing Engineering, Purchasing and Quality Control departments. Team members do not use the title Value Engineer or Value Analyst. Each retains his basic job title, but is relieved of any other responsibilities during his period of work on the team. Team membership is rotated so that over a period of time the cost reduction concept will be acquired throughout the company.





POLARIS MISSILE antenna cavity (top) was assembled from 28 separate machined parts and 78 sets of bolts, nuts, and washers. Value analysis team found that it could be made as a single casting (left), cutting costs 63%.

The value team is assigned to study a specific product for a specific period and with a pre-determined cost reduction goal.

By assigning teams to specific products and by rotating team membership Sperry Phoenix gets a far

continued on page 54

Helpful Hints for Die Casters

—from Bethlehem's Tool Steel Engineer

Don't overharden hot-work tools

Although most hot-work steels are capable of being hardened to Rockwell C 56-60, there are practically no hot-work applications where such hardness can be used successfully. In fact, the majority of hot-work tools are used in a hardness range of from C 41-44, or from C 46-49. The most common mistake on new hot-work jobs is to heat-treat to a hardness level which is too high for the application. Under such conditions, rapid heat-checking or breakage occurs. For instance, many tools made of AISI H-13 type of hot-work tool steel have failed prematurely because they were used at Rockwell C 55 or higher. Tools of this grade can seldom be used above Rockwell C 52.

On every hot-work application it is necessary to determine the best hardness level, and this can be obtained only through experience. There always is a compromise involved. The highest hardness is best for wear resistance; the lowest hardness is best for resistance to cracking. Users of hot-work tools usually are more satisfied with tools which eventually wear out, rather than tools which break in service.

New Cromo-N Tool Steel has maximum resistance to heat-checking*

TYPICAL ANALYSIS

Cromo-N

C	Mn	Si
.23	.60	1.25
Ni	**Cr**	**Mo**
.75	10.00	1.20
V	**W**	**N**
1.00	.45	.10

* Patent pending.

Cromo-N, Bethlehem's new 10 pct chrome-nitrogen hot-work tool steel provides optimum resistance to heat-checking at elevated temperatures. That's why it's the ideal grade for making aluminum die casting and forging dies, extrusion press tooling, and mandrels for extruding all non-ferrous materials.

Cromo-N is a special low-carbon, high-chrome grade with carefully proportioned alloying elements for proper hardenability. Its low carbon content provides excellent resistance to heat-checking. Its nitrogen combines with the carbon, making it easy to obtain the proper working hardness of Rockwell C 44-46, which results in excellent resistance to erosion or washing. And the high chrome content results in improved hot-work characteristics. Cromo-N also has good weldability, using the same procedure followed for 5 pct chrome hot-work steels. Ask your Bethlehem tool steel distributor for full information.

Steel *for Strength ... Economy ... Versatility*

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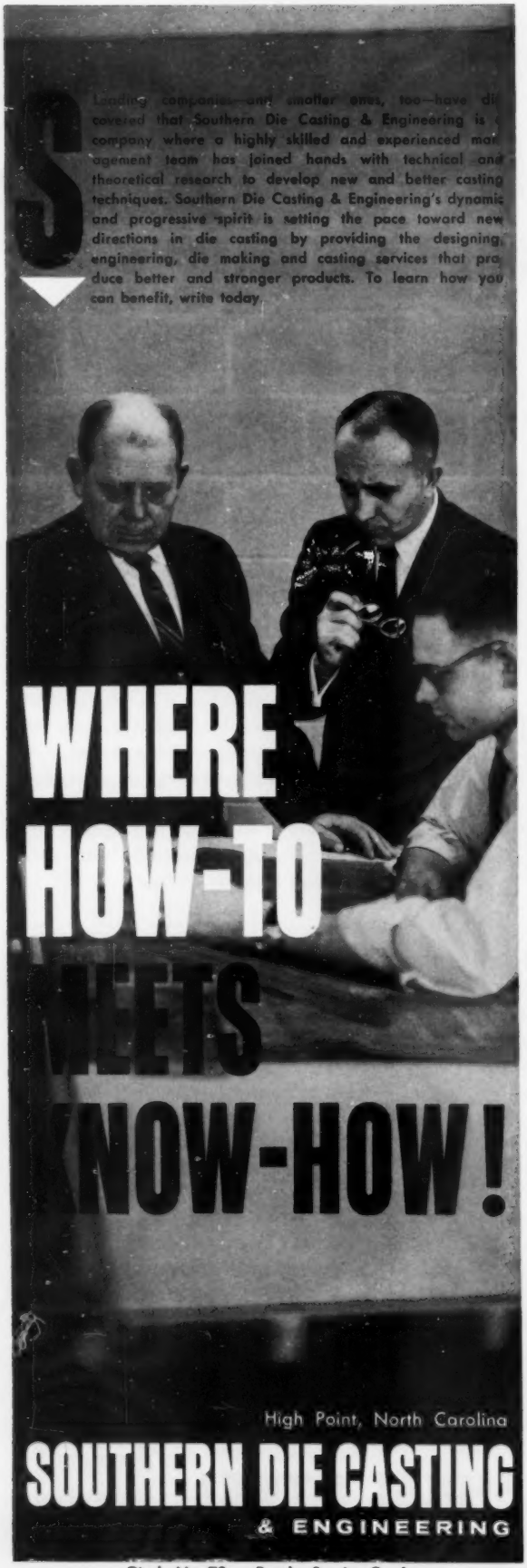
Leading companies—and smaller ones, too—have discovered that Southern Die Casting & Engineering is a company where a highly skilled and experienced management team has joined hands with technical and theoretical research to develop new and better casting techniques. Southern Die Casting & Engineering's dynamic and progressive spirit is setting the pace toward new directions in die casting by providing the designing, engineering, die making and casting services that produce better and stronger products. To learn how you can benefit, write today
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HOW-TO
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continued from page 52

higher cost reduction than used to be realized through a cost reduction committee.

Reports O. Hiscox, manufacturing manager for Sperry Phoenix:

"In the past, many of our products were subjected to the usual product cost reduction committee approach—and we got five to ten percent. We now know that reductions of 20 to 40 percent are possible through a well organized value program."

Actually, cost reductions of up to 92 percent have been scored in some cases by Sperry Phoenix Value analysis teams.

At Sperry value analysis is directed to getting a function, rather than just a piece of hardware, for the lowest cost. A value analysis team wil direct five primary questions toward a component under study: What is it? What does it do? What does it cost? What else will do the job? What does that cost?

"By exploring fully these five questions, many untouched areas of cost reduction are brought to light," says Hiscox.

Lockheed's techniques are closely similar, and in reviewing the antenna cavity assistance was obtained from both electrical and structural engineering design specialists, working with representatives of Value and Production Engineering, Procurement and Manufacturing sections, all participating on the Polaris Value Engineering team.

At the outset the antenna cavity, due to its complexity, did not suggest a switch from assembled parts to a single casting. The assembly consisted of two roll ring forgings machined to form outer rims, two enclosure and plates, a center plate and miscellaneous supporting and structural parts including ribs and cable ports, all fabricated from aluminum.

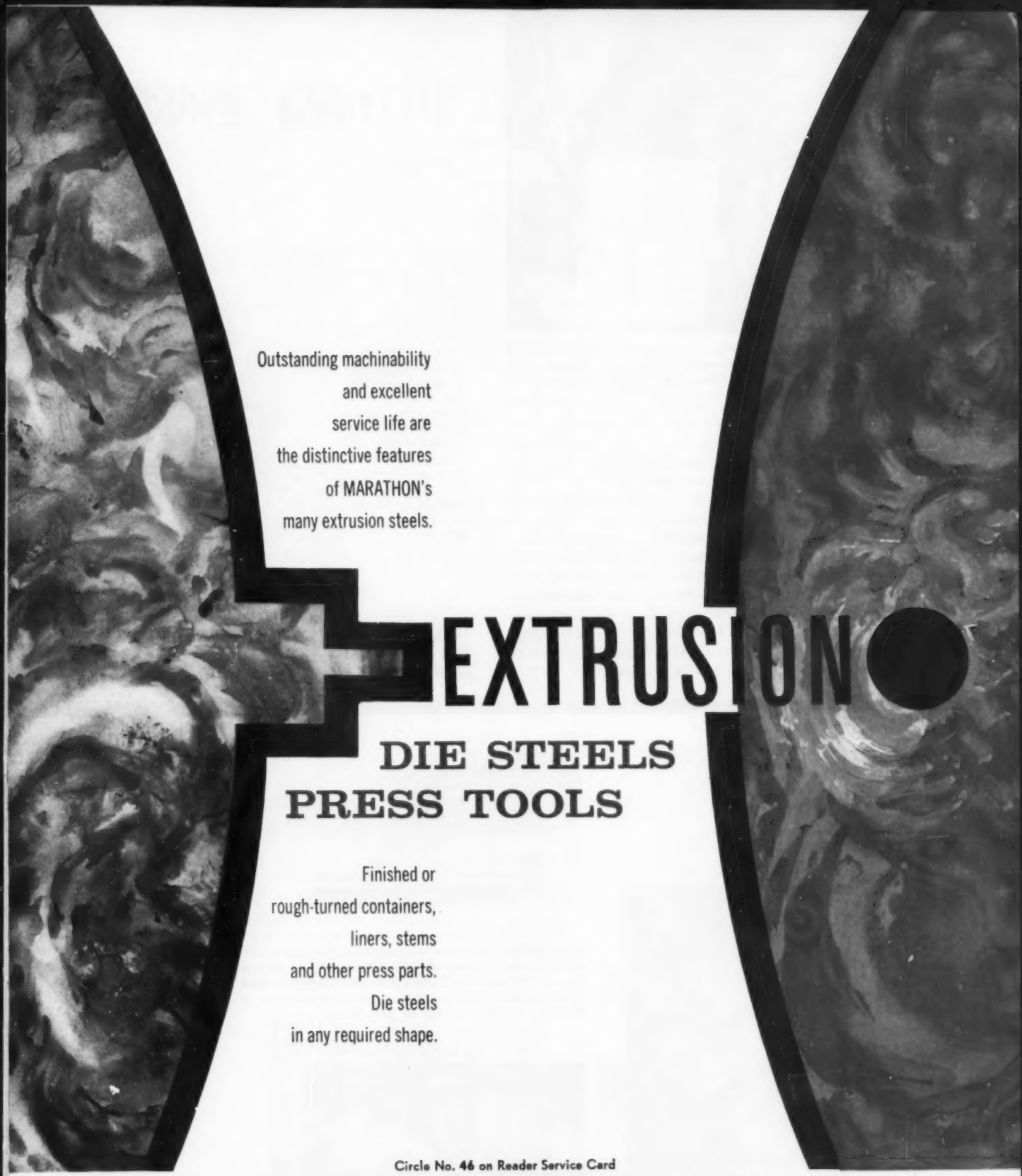
Several possible lower cost designs were studied. The two most promising proposals were (1) an assembly of cast aluminum rims and a cast aluminum center plate with integral cable ports and ribs, and (2) a single aluminum casting. The single casting offered optimum value but presented many difficult design problems. However, it finally was selected when design feasibility was proved.

The design problems of the single casting called for use of all engineering resources of the team. The part had to maintain strength requirements within weight limits. In final design, the casting gave a 10 percent weight reduction. As cast it would have to yield a surface flatness of .020 max. and finish of RMS 80-100 max. In redesign ribs were added on both ends for support strength and gating.

Lockheed's voluntary value engineering program starts with initial design and goes beyond the requirements of both government and other contractors.

Both of these West Coast manufacturers, Lockheed and Sperry, doubtless would continue value analysis even should they be relieved of governmental prodding and be converted over night to consumer goods production.

They are but two of hundreds of major prime manufacturers throughout the nation who attest to the cost cutting dividends paid by using the technique.



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and excellent
service life are
the distinctive features
of MARATHON's
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EXTRUSION

DIE STEELS
PRESS TOOLS

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MARATHON

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1961 ZINC DIE

GRAND PRIZE award certificates and checks were presented at the annual American Die Casting Institute banquet last September to Melvin E. Guillaume and Paul R. Klingspron Jr., who accepted the award for Donald H. Hardey

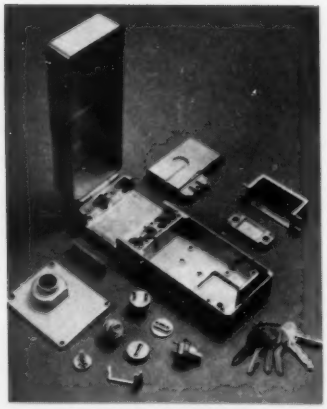
A COUNTER ASSEMBLY for an elapsed time indicator has been named Grand Prize winner in the annual "Zinc Die Casting of the year" competition sponsored by The New Jersey Zinc Company.

The counter assembly, smaller in circumference than a dime and about ⅝" thick, is made from eleven precision zinc die castings. The parts are die cast by Hadlock & Temte, Inc. for the Bowmar Instrument Corporation. For their contributions to the successful design and production of the castings, checks for $500 were awarded to Melvin E. Guillaume of Bowmar and Donald H. Hardy of Hadlock & Temte.

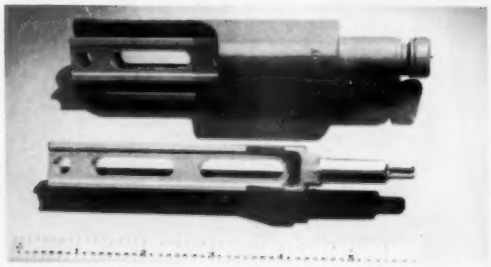
GRAND PRIZE WINNER is this elapsed time indicator (left), smaller than a dime. The indicator is made from eleven zinc die castings (right) with dimensions held as close as 0.0005". Zinc alloy made it possible to design the parts as die castings.

The counter assembly is the heart of Bowmar's Model 1440 Miniature Elapsed Time Indicator (ETI). This is a decimal-type counter used on digital computers to indicate the total time that the equipment

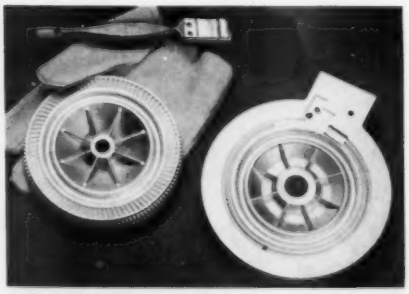
AWARDS OF DISTINCTION



TIME RECORDING LOCK assembly was designed by M. E. Johnson of Falconer Metal Specialties Co. from sketches supplied by Louis Gohen of Phelps Time Recording Lock Company. One basic assembly using fifteen die castings handles twenty-eight types of door installations.

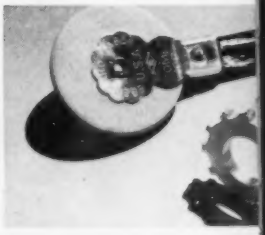


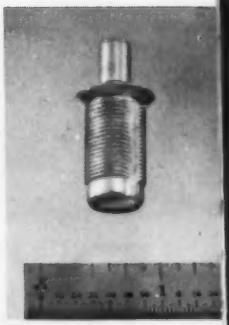
STRENGTHENER for a plastic coupler was developed by H. Arneson of Jandy Products and Ernest Ike of Western Die Casting Co. The casting is used to strengthen plastic couplers used for attachment of cleaning heads to swimming pool poles.



ROTOR and backplate for a memory timer senses the painting requirements for parts passing along a conveyor. Bruno Enssle of Binks Mfg. Co. and W. G. Treiber of Chicago White Metal Castings Co. developed the castings.

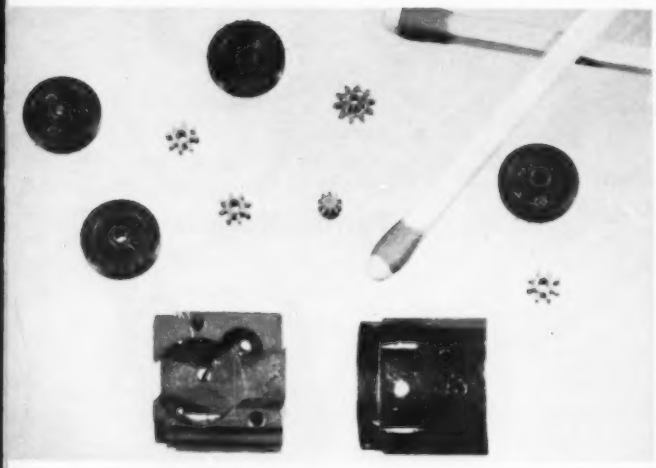
INSTRUMENT print wheel is cast at a cost of 35¢ each, replacing wheels engraved from steel (right) costing $8.50 each. A. Bucher of





THREE mating die castings are the heart of a push button fastener used for fast access to panel assemblies. E. Natkins of Gries Repro-

CASTING OF THE YEAR



has been in operation. Use of an ETI permits equipment checkout at specified intervals.

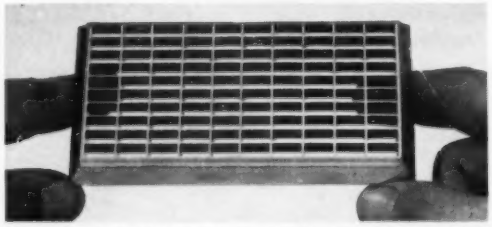
Bowmar's counter is self-contained, including the motor, and is filled with inert gas and hermetically sealed. It consists of a two-piece housing, four counter wheels and five tiny gears, the smallest of which is a ten-tooth bevel gear just 0.063" high.

Cost savings by making the parts as zinc die castings were 91.5% compared to machining the housing from aluminum bar stock and the gears and counter wheels from brass. Tooling costs for the eleven castings were $14,000. Bowmar expects no difficulty amortizing these costs.

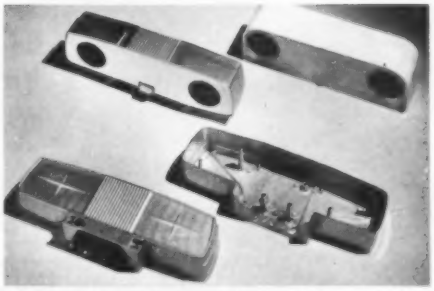
Dimensions on the gears are all ±0.001". All gear included angles are held to 15 minutes. The depth of the teeth on the counter wheels is 0.023" ±0.001". Dimensions on the housing are all held to ±0.002" with one exception. Two posts on one half of the housing must fit snugly into corresponding holes in the other half of the housing. To achieve this, hole diameters are held within 0.0005".

Nine runner-up castings receiving Awards of Distinction are shown below.

Springfield Die Casting Co. and G. E. Tranter of Minneapolis Honeywell Co. developed the casting.



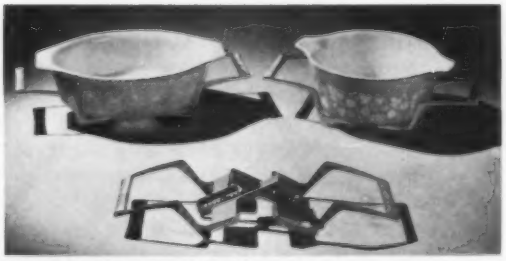
PROBLEMS of hot air re-circulation in air-cooled navigation units for aircraft were solved by this louvre in the chassis casing. Awards for this casting went to A. C. Boultinghouse of Withrow Die Casting Co. and Leonard Maletz of Hoffman Electronics Corp.



LAMPHOLDER for fluorescent light fixtures was designed by David Morgenstern of Nelmor Mfg. Co. for the Electroline Mfg. Co. The die cast holder replaces a steel stamping shown in the upper right of the photo.

ducer Corp. designed the castings for Camloc Fastener Corp. One push locks or unlocks the fastener.

FOR THE NEXT four years this 4/5 size model of a Colt .44 revolver will be sold as a Civil War Commemorative piece. All but the trigger, hammer and handgrip are zinc die cast, winning an award for K. B. Morrision of Newton-New Haven Co. and L. R. Knauer of Colt's Patent Arms Mfg. Co.



AN INGENIOUS adjustable cradle, conceived and designed by Jack J. Punke of Cast-O-Matic Corp., accommodates any shape and size casserole or serving bowl. It is made for the Corning Glass Company as an accessory for heat resistant glass cookwear.

Just a few OF MILLIONS of structural powdered metal parts.

DESIGNING FOR POWDER METALLURGY

By **T. L. ROBINSON**, *President, Powdercraft Corp.*

IN THE EARLIER portions of this report we discussed the design of specific types of parts widely used in industrial and consumer goods. Within the limits given in each case these parts can be made economically from metal powders.

There exists, however, a bewildering array of parts which are specific to individual designs and which have no counterpart in equipment made by other than a single company. These are the so-called miscellaneous industrial parts. They probably make up the bulk of the structural parts made by the powdered metal fabricators.

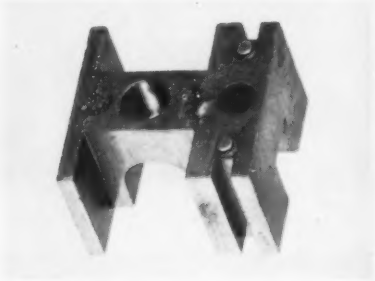
No specific design rules can be set forth for these parts. Each must be considered of and by itself.

The parts, then, shown below are simply examples of applications of powder metallurgy. *They should suggest to the designer many ways in which he can utilize powder metallurgy to get a better part at a lower manufacturing cost.*

One word of caution—the mechanical properties of sintered metal parts will depend upon part shape. Published data are test bar results and should be for guidance only. Establish the *real* mechanical properties based on expected or known service requirements; then consult a reputable vendor as to materials *and follow his recommendations.*

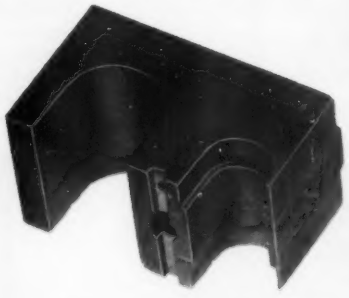
MISCELLANEOUS INDUSTRIAL PARTS

Textile Machine Part



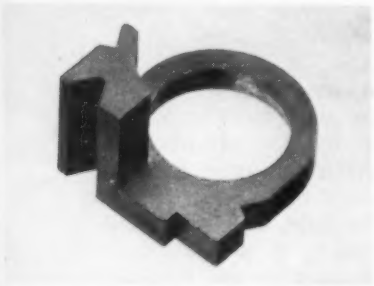
Formerly an iron casting which cost from 15¢ to 20¢. Milling operations were from $2 to $3 per piece. The locating pins on one surface had to be put in as a separate operation as would the numbering of the part. As a powdered metal part it is used as received with pins and numbers already in place. Tooling for this part was about $800.00.

Textile Machine Part



Here a powdered iron mixture has replaced an iron casting. On this piece, one milling cut must be made to finish it, but this cut is quite simple and eliminates five other very expensive milling operations. There was a marked reduction in manufacturing costs. Tooling cost was about $1000.00.

Microscope Lens Slide



Formerly a wrought bronze forging, this piece required precision milling and boring cuts. It is used as pressed and sintered. Tolerances on this part are closer than normal commercial practice. Tooling costs are about $700.00 for this piece.

Small Iron Flange

Typical of a part designed to be made from metal powders, this flange would almost defy normal machining methods as a means of manufacture. Costs, by machining methods, even if a casting were the starting point, would be excessive. Despite its complexity, tooling for this piece was only about $600.00.

Bronze Mounting Plate

A part for a teletype machine which seems quite simple to make either from wrought stock or to machine a casting. Without the lugs, machining would be quite simple and inexpensive. However, the cost of making separate lugs and fastening them accurately in place made the cost very high. As a sintered bronze piece, the cost was nominal. Tooling costs were, however, rather high, about $1000.

Lock Part

Made in nickel silver, this part of a refrigerator door lock looks like a typical stamping. However, it is too thick for economical stamping and scrap losses of expensive material would be high. It is used as pressed and sintered.

Latch

A simple part which should be easy to make as a stamping. However, close tolerances and thickness made it uneconomical to produce this way. Further, the location of the pins is quite critical so that a precision drilling operation had to be done and the pins fastened in place. This part is made of powdered iron and hardened. It is steam treated to give corrosion resistance.

Solenoid Head

This part is a good example of very small pieces. Easily made by powder metallurgy, it would be very difficult to make by any other method. The piece carries a stem which is separately machined and fastened to the head. Originally the two pieces were made as a single part and were extremely expensive. As a powdered metal part the head is ready for assembly and is quite inexpensive.

Step Bearings

Used on spinning spindles, these bearings have a conical hole at the bottom of the bore to accept the spindle. The speed of the spindle is 12,000 RPM and it is of hardened steel. Earlier practice was to cast the bearing and then run-in the spindle to get the desired shape. As a powdered iron part the precise shape required is molded into the piece so that the run-in is eliminated. A further advantage of powder metallurgy in this case is self lubrication.

Glass Seal Mold

To make vacuum tight electrical connections, the lead-in wire must be sealed to glass which can, in turn, be sealed to a glass enclosure such as an incandescent lamp. The molds must be heat and oxidation resistant and must not stick to molten glass. The part shown is

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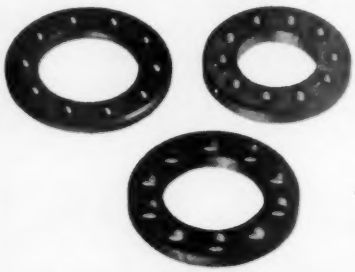
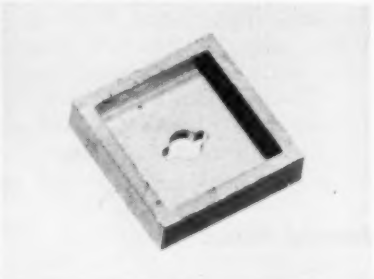
made in pure nickel, this satisfies the above conditions. Manufacturing costs are lower by powder metallurgy mainly because scrap losses are eliminated.

Ball Thrust Retainers



A piece extremely difficult to machine, but very simple to make from bronze or brass powders. Five very precisely spaced holes had to be drilled and counter-bored from each side so that balls could be dropped into place, but not pass through. The balls are then staked in place as shown in the assembled thrust bearing. (Note that the assembled bearing is the older type made from brass bar stock.)

Handle Ferrule



Two of these nickel silver ferrules are needed to hold the wooden handle onto a barbecue fork. One of them must have engraving on the top, but does not have a hole. The ferrules are press fits onto the handle and the fork shank is staked into the hole. The odd shape of the hole is to prevent the fork from turning in the handle. Engraving is done on the die by jewelry engravers and in this case the lettering on the die is raised so as to give depressed lettering on the part. Powder Metallurgy is used to cut machining time and scrap losses of expensive metal.

Textile Machine Latch

Here's an iron powder part which would be extremely difficult to make by normal machining methods. In fact, about the only other economical method of manufacture would be as a forging and then considerable machining would be required. The latch is ready to use

as molded and sintered. A spring retaining groove is formed in each side and the depressed lettering is molded in. Note that neither hole is round and the thickness is not constant. The lettering is formed by a separately engraved insert in one of the punches.

(Editor's note: This is the final article of this series by Mr. Robinson. Reprints of each section are available at 35¢ each, or the entire series may be purchased as a single reprint for $1.50.)

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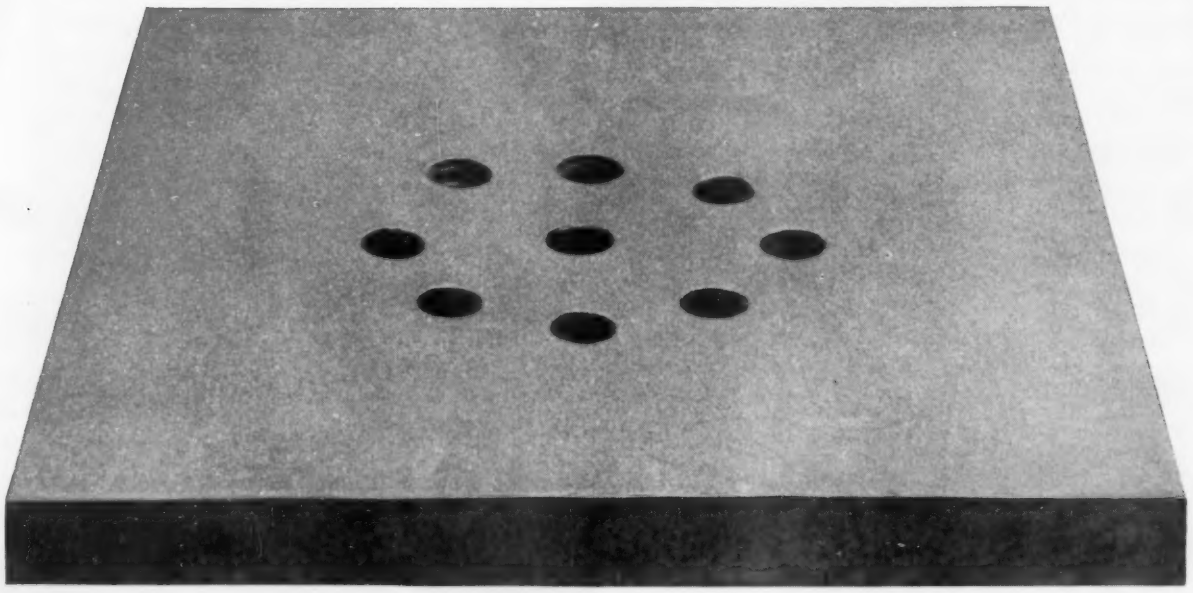

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Purchasing role in value analysis

By **P. B. McSHERRY,** *Vice President—Sales, Parker-Kalon, Clifton, N.J.*

The so-called profit pinch being experienced by many companies today has resulted in vigorous campaigns to reduce expenses. Part of this has been an increasing awareness of value analysis. Understood and supported, it can provide the competitive edge by enabling a company to offer the consumer a better product. Relating this to the simplest of assembly components—the screw fastener—here's how purchasing can back up and support design and production.

VALUE ANALYSIS IS FAST becoming the keynote of enlightened purchasing practices. It gives the purchasing agent a scientific approach to purchasing, and increases his contribution to business productivity and profit.

As widely understood and applied by design, purchasing, and production, value analysis is the systematic appraisal of functional value. It helps to determine the product, part, or material which will function reliably at the lowest possible cost.

An excellent example of a component part that can be evaluated in terms of in-place cost is a threaded fastener. By in-place cost we mean not only the price paid for the screw, but the labor cost of application, plus the down-time cost and the added labor cost in the event of failure on the assembly line. Another consideration is the replacement or service costs that can be incurred in the field under guarantee and/or warranty

plans offered the customer.

The cost of all these factors, as amazing as it may seem, is four to five times the initial cost of the screws themselves.

Cost Small, Importance Great

The cost of screw fasteners is a small, almost insignificant item when compared to the cost of other materials and parts. As a matter of fact, the total steel consumption of the fastener industry is only 3 per cent of all steel used in the United States. But if it were not for this 3 per cent, much of the other 97 per cent could not be fabricated into automobiles, appliances, jet planes, etc.

Therefore, even the fastener, the commonly-called hardware shelf item, plays an important and integral part in our nation's industrial output. On the production line, the fastening operation—whether utilizing screws or other means of joining—accounts for 50 to 75 percent of the cost of most manufactured goods. Frequently, however, the fastener is relegated to a subordinate position, not only in production analysis programs, but at the original design and purchasing levels as well.

In effect, we are asking: Are the screw fasteners used on your production line doing the job specified by the designer? And, at what cost in terms of labor and production time? For just as there are price differences in screws, so too are there production differences. While screws may look alike, not all screws perform alike.

As an aid in instigating a fastener evaluation program, a guide and worksheet for tapping screws is given in figure 3. Various types of tapping screws, "A," "B," "F," "L," etc., are illustrated in fig. 2. The guide and worksheet takes into consideration most cost factors which may affect the efficiency of an assembly operation.

Starting with the initial cost of the fasteners, you can determine if they have the lowest in-place costs and are doing the assembly job required. As a result, you can determine the true value of the prices paid for screws from various suppliers and create an approved list of vendors, based on actual on-the-line performance tests.

Quality Test outlined

Tapping screws must meet five basic quality tests to insure low in-place costs on the production line:

1. Screw heads must be concentric with the body to give good bearing contact in the assembly.
2. Slots must be accurate and uniform to assure the screws being driven properly.
3. Driving recesses, such as the Phillips Recessed Head type, should be accurately centered and uniform in depth to eliminate the chance of driver slippage and the resultant marring of finished product surfaces.
4. Screw threads should also be uniform in diameter, sharp crested, and free from burrs to prevent erratic driving torque.
5. The screw must function satisfactorily for the application. Functionability is determined by the proper relationship between the core hardness and the case hardness. If screws are too soft, they will not drive; if they are too hard, they will break.

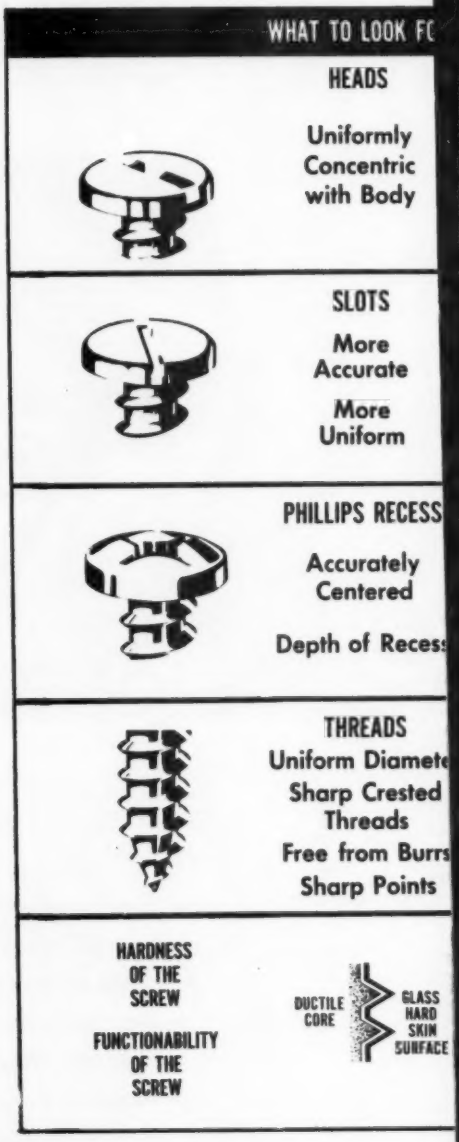
While these basic quality areas for screws may not materially affect the entire assembly, one or two singled out on a production line may be all that is needed to send costs spiraling and put the pinch on profitable assembly operations. Thus, any value analysis program should include the receiving department. Faulty or sub-standard screws passed on to production by inspectors tend to increase in-place cost of the assembly.

Therefore, make incoming material inspectors aware of not only what to look for, but how to test the material received. A value analysis criteria should be made available. It should be similar to these for tapping screws as shown in the Value Analysis Chart, fig. 1.

Faulty fasteners are costly

Elimination of substandard screw fasteners is particularly important in automated screwdriving operations. If a screw is not driven into the assembly properly, production must be stopped and the screw removed and replaced; or the unit must be taken off the line to be salvaged at a later date. In either case, there is down-time and the added expense to drive another screw in-place. Also, poorly made screws can cause excessive wear on expensive screwdriver bits or hex sockets, which further increases the in-place cost.

When using power screwdrivers operators must drive and tighten screws to proper torque settings to obtain full efficiency of the fastener. Poorly formed slots or recesses cause the driver to ream out, which may mean screws are not driven home completely. The result is further production slow-downs while an effort is made to seat the screw. If screws are overdriven, the screw threads may strip out or the assembly material may fail. In either case, there is no fastening at



VALUE ANALYSIS CHART FOR TAPPING SCREWS

HOW TO CHECK	WHY THESE ARE IMPORTANT	WHAT TO LOOK-OUT FOR
2 step gage to straddle body of the screw. The 2 steps are the "Go" and "No Go" limits of the dimension. Grip Screw in a true running collet, indicated reading will tell the amount of deflection from the screw axis. Also observe the screw under a microscope or visually.	In automatic driving, the screw is usually positioned by means of the head passing through a tube or being guided down rails. For this reason, the outside diameter of the head must be uniform. The head of the screw must be square with the body to obtain good bearing contact on the application.	IS HEAD ECCENTRIC? IS HEAD UNDERSIZE? DO HEADS POP OFF?
Width or depth can be checked with feeler gages or a special "Go" and "No-Go" gage. Visual inspection	To avoid downtime on today's high-priced, automated assembly lines, it is most important that the screw be driven into the assembly without failure. In some cases, the screw may not be driven properly because of poorly formed slots or recesses in the head. As a result, the assembly line stops and the screw must be removed and replaced, which is an added expense to the operation.	IS SLOT NARROW? IS SLOT TOO DEEP? IS SLOT TOO SHALLOW? IS SLOT OFF CENTER?
Depth of penetration gage n the recess is properly formed, the penetration gage will reach the proper depth in tolerance), this will assure driving the screws without any difficulty. If the s is malformed, the gage will indicate that the recess is shallow (outside of tol-ce) this will cause the screw driver to cam out of the recess and the driving of crew will be more difficult.	The Phillips recess adds remarkable ease and speed in driving and starting is faster. When a Phillips Recessed Head is used in a power driver, the driver automatically centers the screw above the work and keeps it that way while the fastener is driven. The formation of the Recess helps grip the driving bit. As a result the operator can use his power driver in awkward positions. Stopping on the assembly line to re-engage is eliminated and the chance of driver slippage and consequent marring of costly product surfaces is minimized.	Recess RECESS NARROW? RECESS TOO DEEP? RECESS TOO SHALLOW? RECESS OFF CENTER?
e screw in mi-eter to check of round-. Snap gages d be used for inspection of d diameter. Check well-defined thread forms tapering off to the root diameter at the point. Taper should be uniform over two revolutions of the thread in Thread-forming screws. This gradual tapering off should extend over two pitches of thread and taper from a single crest to a double crest. Threads should have the same height at any one point. Root diameter can be checked with a pointed anvil micrometer or a fixed "Go" or "No-Go" gage. A visual examination for wavy threads or imbedded chips, rough or flaky threads is also recommended.	Since automatic driving of screws requires predetermined tightening torques, drivers should be equipped with a torque limiting device. If overdriven, the threads may fail or the material will fail. The "driving torque" or power which is required to drive the screw, is dependent upon the thread formation. Since the outside diameter of the thread is a function of the driving torque, it is important that thread diameters be uniform to prevent erratic driving torques.	WAVY THREADS FLAKY THREADS CHIPS TRUNCATED POINT
Tapping Screw should take a 15 sharp bend with-t breaking. Under impact, the head should deform ightly without chipping at the edges. The thread ould be hard but not brittle. A combination of e chemical composition of the material in the crew, the core hardness, the case hardness and e depth of the case, determine the functionability the screw.	If screws are too soft, they will not drive. If they are too hard, they will break.	TOO HARD TOO SOFT

Figure 1. VALUE ANALYSIS CHART tells how to evaluate quality and performance of tapping screws

this point and production costs again climb.

The purchasing agent who is aware of these problems and knows how to prevent them, takes on part of the responsibility for quality control. That is, either by himself or in cooperation with design, production, and inspection, he can institute and maintain a fastener evaluation program.

Formula measures functionability

A simple but useful test has been devised to help inspection and production departments evaluate fasteners. The test utilizes a Function Factor, which measures the qualities of tapping screws either in use or contemplated for use on the production line.

The test is based on the premise that:

(1) the better the screw resists failure after being driven home, the stronger the assembly;

(2) the easier the screw is to drive, the less wear there will be on driving tools and on the operation;

(3) thread failures, either on the screw or in the work, give rise to costly, time-consuming salvage operations as well as other less tangible production costs.

On production lines, most engineers measure the performance of the fastener in terms of service ratio. This is based on consideration of strip torque, T_s (the measure of force to strip screw threads or cause failure in the engagement material and the drive torque, T_q, (the measure of force to drive a screw). In actual assembly practice, strip torque is further evaluated as a measure of true effectiveness of the assembly.

Therefore, in order to give proper weight to the service ratio (strip torque over drive torque), as well

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MANUFACTURER AND CONSUMER TYPE DESIGNATIONS FOR TAPPING AND METALLIC DRIVE SCREWS

TYPE	P-K	ASA	FEDERAL	
	A	A	A	
	AC	none	none	TYPE A THREAD WITH TRUNCATED GIMLET POINT
	BA	none	none	TYPE B THREAD WITH GIMLET POINT
	B	B	B	
	BF	BF	BF	
	BP	BP	BP	TYPE B THREAD WITH A POINTED PILOT
	C	C	C	
	F	F	CF	
	J	none	none	TYPE A WITH STRAIGHT SHANK, THREADED TO END
	L	none	none	TYPE B THREAD WITH FLAT ON THE TAPER
	Q	none	none	TYPE C THREAD WITH ONE OR TWO LARGE FLUTES
	Q5	none	none	TYPE B THREADS WITH ONE OR TWO LARGE FLUTES
	U	U	U	
	TAPITS	none	none	SLOTTED WASHER HEX HEAD TYPE A THREAD & PYRAMID POINT
	21	none	none	POINTED PILOT DRIVE SCREW WITH ANNULAR RINGS UNDER HEAD
	T	none	none	TYPE B FLAT CREST ON THREAD THREADED TO END

Figure 2. CHART is a handy reference for classifying screw types

as the practical measure of assembly effectiveness (strip torque), we arrive at the function factor (F). The formula is:

$$F = \frac{T_s^2}{T_q}$$

Using this formula, you can accurately check the screws to obtain the best fastener in terms of overall functionability.

In practice, this would mean selecting random sizes of screws purchased on the open market from a variety of sources. Each screw is then driven by a torque testing machine into one or several materials, depending on manufacturing requirements. The screws are driven into holes simulating assembly conditions. The maximum driving torque is then recorded.

The second phase of the test is to determine the amount of torque which can be applied before (1) the screw fails in the material; or (2) the screw itself fails. By applying the function factor formula, we determine which screws give the best performance.

We have provided three means of determing the performance reliability of threaded fasteners: an evaluation guide and worksheet, fig. 3, a value analysis chart, and the function factor formula. Used in combination, these aids give the basis for a thorough value analysis program which can be a cooperative effort between design, purchasing, and production.

The purpose, of course, is to find the true in-place cost. While the failure of a single threaded fastener

IN-PLACE COST ANALYSIS WORK SHEET

Operation Description

Part # _____

Fastener Type _____

Size _____

Head Style _____

Finish _____

Assembly of _____

To _____

No. of fasteners per assembly _____

Length of production run _____

No. of fasteners in total run _____

Factors That Affect Your In-Place Cost of Fasteners

		Column A In-Place Cost of Fasteners Now Used	Column B In-Place Cost of Other Fasteners
1	Total initial cost* of screws	$	$
2	Labor cost for applying Fasteners	$	$
3	Downtime cost for removal of faulty screws (Include removal time; conveyor stop-start; rerouting of line)	$	$
4	Added costs (Include salvage; special machinery required; broken screw-driver bits, inventory costs for salvaged parts)	$	$
5	Cost of unsalvageable rejected parts due to screw failure	$	$
6	Added cost of warranty service charges due to screw failure in field	$	$
7	Actual In-Place Cost (Add Items 1-6)	$	$
8	Place item 7, Column B below item 7, Column A	$	$
9	SUBTRACT	$	$

*Price based on normal production run quantities.

Figure 3. EVALUATION GUIDE AND WORK SHEET

on the assembly line may seem a relatively unimportant thing, we have tried to show here that it can multiply the original price of the fastener many times.

Added to this is the performance of the product in the field, both from the standpoint of the company and the consumer. Faulty fasteners and assemblies that reach the consumer mean added costs in services and replacement parts.

Further, a faulty product in the hands of the consumer reflects unfavorably on the quality standards of the company and can result in lost sales.

Therefore, any basic analysis on the purchasing level must provide the best combination of functional characteristics for a fastener, regardless of type, and in terms of the lowest in-place cost. And, starting with an evaluation program for tapping screws as set down here, the purchasing agent can make his own value analysis of fastener operations pay off by reducing assembly line and in-the-field service headaches.

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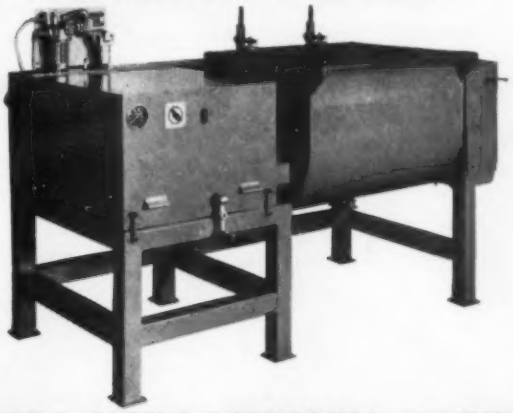

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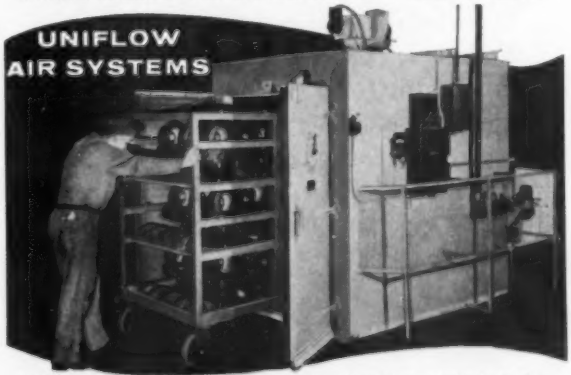

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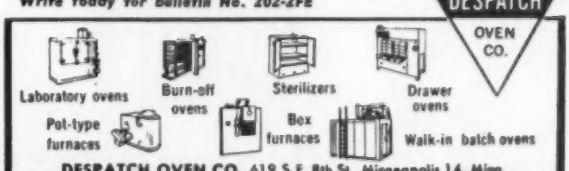

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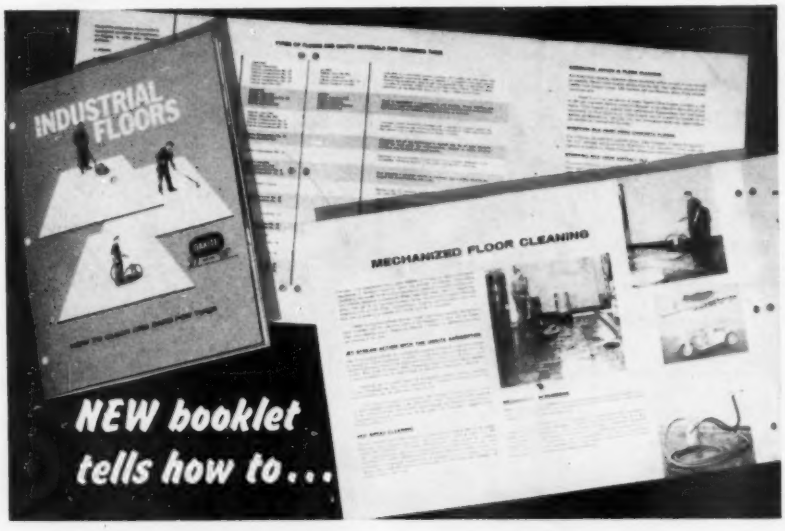

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In addition, the booklet discusses *mechanized* methods of floor care, and the remarkable savings they make possible in hours, effort and expense. Ask the Oakite man about "good housekeeping" for the plant. Meanwhile, send for your copy of *Industrial Floors: How to clean and care for them* today. Write Oakite Products, Inc., 54 Rector Street, New York 6, N. Y.

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OAKITE
over 50 Est. 1909 SCIENCE
years' leadership in industrial cleaning

Technical Service Representatives in Principal Cities of U. S. and Canada
Circle No. 79 on Reader Service Card

promotions & changes

Continued from page 28

Norwalk Powdered Metals, Inc.—*Arthur C. Loven* has joined the sales staff.

Foote Mineral Co.—*Norman P. Gentieu* has been named advertising manager. He succeeds *John W. Donahey*, who has been made manager of marketing services and sales promotion.

Olin Mathiesen Chemical Corp., Metals Div.—*Joseph F. Krepley* has been appointed director-extrusion operations, and has been succeeded in his former capacity of sales manager-extrusion operations by *Robert W. Pierce*, who was formerly Boston regional sales manager.

U. R. (Rick) Jaeger has been appointed special projects manager, and is succeeded by *C. O. Kunz* as sales manager of Roll-Bond products.

Misco Precision Casting Co.—*Richard W. Martini* has been appointed assistant chief metallurgist, and *John A. Finnegan* is a technical representative in New England.

MARTINI

FINNEGAN

Martini was formerly with Sivyer Steel Casting Co., and Finnegan was experimental test engineer at Pratt & Whitney Aircraft.

Magma Copper Co.—*Francis Cameron*, president of St. Joseph Lead Co., has been appointed as a director at Magma.

Quaker State Metals Co.—*John B. Gage* has been appointed special products manager. He was formerly sales manager for Sheet with Anaconda Aluminum.

Shaw Process Development Corp., Division of Avnet Electronics Corp.—*Irwin J. Lubalin*, formerly general manager, has been promoted to executive vice president. He has also been appointed vice president of British Industries Corp., another division of Avent, where he started in 1946 as a manager.

LUBALIN

news of industry & associations

Continued from page 25

Cleveland Metal Abrasive appoints Canadian distributor

National Steel Car Corp. Ltd. has been named sole Canadian distributor for Cleveland Metal Abrasive Co.'s line of metallic abrasives. The purpose of this change is to combine National's facilities and knowledge of Canadian markets with Cleveland Metal Abrasive's marketing plans for the Canadian territory for a more effective distribution program. To further facilitate this action, National Car will soon have a complete inventory of CMA's iron and steel abrasive shot and grit.

Hardness standard revised

A revised American Standard on hardness conversion table for metals, replacing three American Standards approved in 1955, has been reported by the American Standards Association.

The newly revised standard, Z76-.4-1961, specifies the relationship between Brinnell hardness, diamond pyramid hardness, Rockwell hardness and Rockwell superficial hardness of carbon, alloy and tool steels, nickel and high-nickel alloys and cartridge brass. Six hardness conversion tables accompany the text.

Copies are available at 30 cents each from the American Standards Association, Dept. P245, 10 East 40th St., New York 16, N.Y. or the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Structural Steel is Olin distributor

Structural Steel and Forge Co., with four aluminum and steel service centers serving the Intermountain West marketing area, has been appointed a distributor for Olin Aluminum mill products.

Structural Steel's offices and main warehouse are in Salt Lake City, with service centers in Idaho Falls and Twin Falls, Idaho, and Rock Springs, Wyoming.

Arwood to open plant in Cleveland

The Arwood Corp. will open its sixth investment casting plant in Cleveland in early 1962.

The installation will be a fully integrated foundry, casting ferrous, cobalt, and nickel base alloys by the solid mold and ceramic shell processes. It will have its own tool and die making, finishing, inspection and heat treating facilities.

Howe Sound forms international division

Howe Sound International, Inc., a new overseas division of Howe Sound Co., has been incorporated in Liberia, and will handle expanding activities in foreign markets.

The new international corporation will have an active operating plant, Austenal-Europa, in Cologne, Germany.

more Industry News on next page

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LESS HANDLING — FASTER OUTPUT
LOWER COST WITH THESE *SYNTRON*

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NEW HIGH SPEED, COMPACT ELECTROMAGNETIC UNITS

—produce 3600 controllable vibrations per minute creating a gentle and total agitation between the parts and media. Finish delicate, difficult, or heavy parts faster at lower costs.

The simple electromagnetic design assures fast, effective, dependable action and low maintenance.

LOADING
Fast, easy! Inspect parts while work cycle continues.

ADJUSTING VIBRATION
One control to vary amplitude.

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Connect hose; flush out compound.

Unretouched photos demonstrate results!

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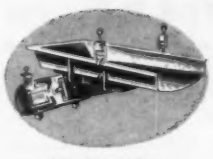

Vibratory Feeders

Rectifier Power Units

Bin Vibrators

Circle No. 82 on Reader Service Card

news of industry & associations

Continued

New firm is founded

The Northeast Refractories Co., 37 Senwood Dr., Old Saybrook, Conn., has been founded by its manager, Arthur E. Olson. The firm will represent several manufacturers, including Vesuvius Crucible Co., and Hiram Swank and Sons and is designed to better serve the metal industry around New England.

Fagersta Steels building new headquarters

Ground has been broken for the new national headquarters of Fagersta Steels Inc. at West Caldwell Industrial Park, West Caldwell, N.J. The firm, one of the largest steel producers in Sweden, and a major manufacturer of specialty steels, plans to move its present Manhattan location to its new building in northern New Jersey during December of this year. The move will bring office, warehouse and distribution functions together.

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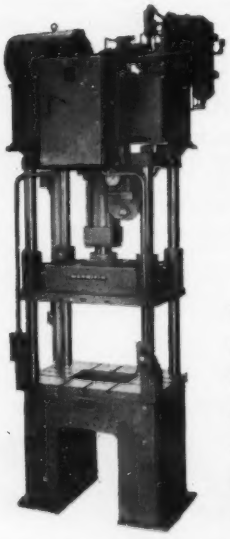

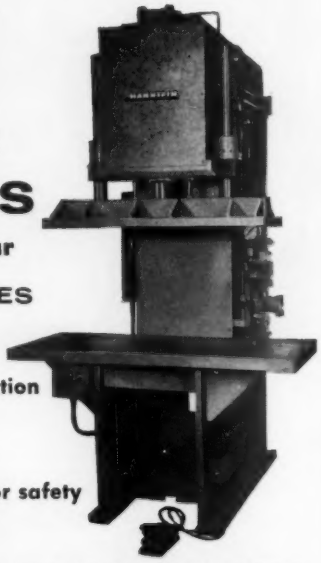

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For the full story of the advantages of high speed hydraulic trimming, send for our Bulletin 142. Or call in your Hannifin representative—he's a trained production analyst.

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Circle No. 59 on Reader Service Card

New metal powder standards

The Metal Powder Producers Association, a trade division of the Metal Powder Industries Federation, has released two revised standards, one for selecting samples from lots of metal powders and the other for the determination of "green strength" of compacted metal powders.

The revised green strength standard specifies two test devices: a constant loading beam device and a compression testing machine with a transverse rupture test fixture, eliminating the rattler test. The weight tolerance of the test specimen was changed from ± 0.10 grams to ± 0.02 grams. A table was added showing the weights of powder required to obtain a given density for standard test specimens of brass, copper and iron. Two choices of test specimen thickness were allowed as a means of improving reproducibility with certain types of powders.

The revised standard, No. 15-61, supersedes No. 15-51, and is entitled "Determination of Green Strength of Compacted Metal Powder Specimens".

The sampling standard is concerned with powders blended manually and in mechanical blending equipment, and powders packaged in containers. The revised standard, No. 1-61, is entitled "Method for Sampling Finished Lots of Metal Powders", and supercedes No. 1-48.

Copies are available at 50 cents each from the Metal Powder Producers Association, 60 East 42nd St., New York 17, N.Y.

National Lead opens plant in Argentina

National Lead Co.'s new subsidiary, Doehler Argentina S.A., has started production at its new die casting plant at Boulogne, a suburb of Buenos Aires. The plant will manufacture die castings for Argentina's expanding automotive industry, and will supply die cast component parts to Argentine manufacturers of washing machines, refrigerators, hand tools, business machines, and other appliances.

The plant has facilities for die casting parts in aluminum, zinc, magnesium and brass, and contains electroplating equipment for nickel and chromium plating.

Thompson opens regional office in Inglewood

The Dage Division of Thompson Ramo Woolridge, Inc. has opened a regional sales and service office for industrial control systems and closed circuit television equipment at 204 Hindry Ave., Inglewood.

The new office will be headed by D. H. Bingham, Jr., regional manager for industrial control products and B. C. Keach, regional manager for closed circuit TV systems.

Consolidated Astronautics to expand distribution

Consolidated Astronautics, Inc. is now manufacturing and selling the air-stable Titanium metal powder and alloy powders containing Titanium, originally developed and marketed by United International Research, Inc.

Consolidated Astronautics plans on expanding the present distribution of Titanium metal powder as well as a large number of other metal powders, alloy powders, carbides, borides, etc., throughout the United States.

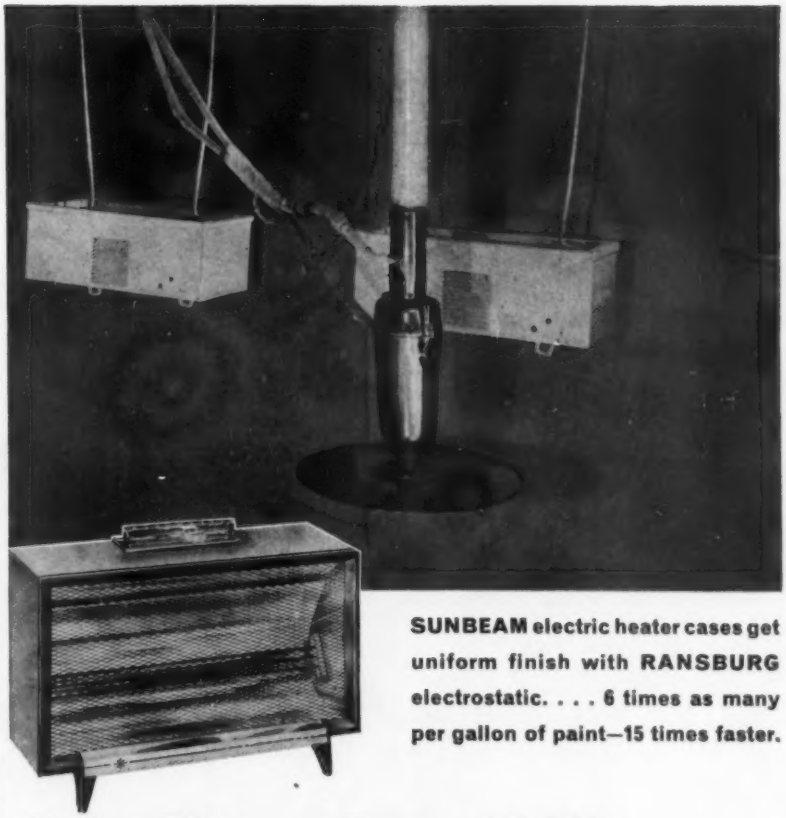
Metal Powder Industries Federation adopts record '62 budget

Members of the Metal Powder Industries Federation met during the last week of September at the Greenbrier, White Sulphur Springs, West Virginia.

Anticipating the more widespread use of powder metallurgy mechanical components and oil impregnated bearings, the members slanted an expanded 1962 budget toward a broad program of industry development.

The prime objective of the program is to bring to the attention of the users and potential users of powder metallurgy products, the fact that modern technology has resulted in new concepts of reliability, reproducibility and precision through advances in tooling and design, improvements in metal powders, availability of a greater variety of compositions, and refinements in compacting and sintering equipment.

Members of the Federation heard Eugene J. Hardy, vice president of the National Association of Manufacturers discuss management's stake in the "New Frontier", and its impact on industry.



SUNBEAM electric heater cases get uniform finish with RANSBURG electrostatic. . . . 6 times as many per gallon of paint—15 times faster.

"Paint Mileage Leaps 500%.... Production Upped 15 Times" Reports ENAMELED STEEL & SIGN CO.

Curt Simmons, President, ENAMELED STEEL & SIGN COMPANY of Chicago, describes results with RANSBURG Automatic No. 2 Process Electro-Spray: "We first painted cases for the new SUNBEAM portable electric heaters with air hand spray at the rate of 200 pieces per day using 6 gallons of paint. Now, with RANSBURG electrostatic we've increased production 1400% to 3000 pieces daily with only 15 gallons of paint." An increase of 500% in paint mileage! *What would savings like this mean in your finishing department?*

QUALITY IMPROVED WITH RANSBURG ELECTRO-SPRAY

Sags and runs, a problem with the air hand spray, have been eliminated with the automatic electrostatic equipment. Mr. Simmons adds: "Now we achieve a uniformity over the configurated area which wasn't always possible before. We know the 50,000th piece will turn out the same as the first."

ENAMELED STEEL—sold on the efficiency and versatility of RANSBURG Electro-Spray—uses 14 automatic No. 2 Process units to meet the heavy demands of their diversified, high volume production.

NO REASON WHY YOU CAN'T DO IT TOO

Manufacturers—large and small—are reporting similar savings in paint and labor with increased production. If your volume doesn't justify automatic electrostatic equipment, perhaps the RANSBURG electrostatic hand gun will help cut costs in your finishing operation. Write for our new brochure showing actual in-plant production photos, savings figures and detailed information on RANSBURG No. 2 Process Electro-Spray.

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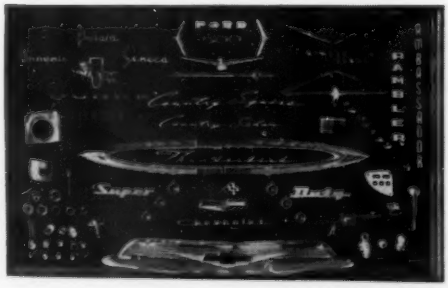
PUTTING THE NEW CARS IN TRIM FOR READY SALES

At the TRILEX CORPORATION, Wayne, Mich., this efficient battery of 14 KUX Hot Chamber Die Casting Machines (400- and 600-ton) is part of the complete Trilex facilities for modern die casting, fully automatic plating, finishing, and assembling.



from these KUX die casting machines

"THE PRIMARY concern of the major automobile manufacturers for die-cast trim parts is *quality*," says John Airey, president of Trilex Corporation, important suppliers in the automotive and appliance field. "That's why we have use KUX Die Casting Machines since 1945. They produce hardware finish quality castings.

"But along with quality," Mr. Airey continues, "auto makers as well as appliance men consider *price*. We've found that KUX machines can be depended on for minimum maintenance and minimum downtime. They put us in a better position to compete on a cost-per-unit basis."

Whether your main concern is lower production costs, higher quality or both, investigate the advantages of KUX Die Casting Machines. 28 all-new strain gauge proven KUX models, 50 to 2000 tons, for both hot or cold chamber operation, available with automatic cycling mechanism and KUX patented "Vac-U-Die" and "Auto Feed" systems of vacuum die casting.

Write for full details of the 28 all-new KUX models illustrated in the latest KUX Die Casting Machine Catalog.

KUX MACHINE CO.

6725 North Ridge Avenue, Chicago 26, Illinois

Circle No. 41 on Reader Service Card

data offered in this month's ads *qualified readers may obtain these free reference materials by circling the numbers on the reader service cards*

1. **Colloidal Graphite**—Acheson Colloids Co.—Brochure gives technical data on colloidal graphite dispersal problems.
3. **Additives**—Alan Wood Steel Co.—Technical bulletin gives data on the use of carbon additives.
5. **Die Casting**—American Die Casting Institute—Product Standard and Product Requirements Information Sheet helps you to get accurate die casting cost estimates. (See also article on page 38)
11. **Investment Casting**—Arwood Corp.—44-page booklet includes practical tips on designing for investment casting.
14. **Die Casting**—B & T Machinery Co.—Technical information showing how to get quality die castings in volume quantities.
17. **Trim Presses**—B.I.P. Engineering Ltd.—Bulletin describes a 50-ton semi-automatic or manual trim press.
21. **Pattern Waxes**—Casting Supply House—Catalog describes how to speed production, lower costs, and increase dimensional stability with Yates pattern waxes.
26. **Reamers**—Conical Tool Co.—Catalog gives information on reamers and tooling equipment.
27. **Standard Unit Dies**—D-M-E Corp.—Technical brochure on lower costs through standardization.
29. **Metal Working Lubricants**—Fiske Brothers Refining Co.—Bulletin describes methods of working aluminum and aluminum alloys.
31. **Small Die Castings**—Gries Reproducer Corp.—"Tiny Parts Guide" shows how to design for small components at savings.
33. **Furnaces**—Hevi-Duty Electric Co.—Technical bulletins describing advantages of Tagliaferri ferrous and nonferrous furnaces.
34. **Investment Casting**—Hitchiner Manufacturing Co.—Technical information on the ceramic shell method of investment casting.
37. **Fire Resistant Hydraulic Fluid**—Hulburt Oil & Grease Co.—Data on properties and performance of Hul-E-Mul with fire protection at conventional hydraulic oil prices.
41. **Die Casting Machines**—Kux Machine Co.—Catalog describes a line of 28 die casting machines.
43. **Heating Equipment**—Lepel High Frequency Labs, Inc.—Catalog on a complete line of induction heating equipment.

OFFERED FOR THE FIRST TIME . . .

The services and reference materials listed here are being offered for the first time in this issue by new PMM advertisers.

18. **Hex Wrenches**—Bowersox Precision Castings, Inc.—Offers wrenches in a wide variety of sizes for use in tightening dies.
23. **Die Casting**—Chicago White Metal Castings, Inc.—Monthly "Die Casting Bulletins" tell how CWM reduces costs with new technical methods.
88. **Die Casting**—Cast-O-Matic Corp.—Offers zinc and aluminum die casting services.
91. **Wax Extruding**—Fiber Resin Corp.—Information on the extruding of wax shapes for use in investment casting.
94. **Powder Metallurgy**—Dixon Sintaloy, Inc.—Offers services in powder metallurgy.

45. **Die Casting**—Madison Kipp Corp.—24-page book shows solutions to solve die casting problems and gives information on other products.
50. **Fire Resistant Hydraulic Fluids**—Monsanto Chemicals Co., Organic Div.—Bulletins describe how to prevent fire in die casting machines by using the correct hydraulic fluids.
55. **Non-Ferrous Powdered Metals**—The New Jersey Zinc Co.—Brochure tells how to design for pressed brass and nickel silver parts.
56. **Die Castings**—Newton-New Haven Co.—Booklet "PDCS . . . Prelude to Production" tells how to avoid costly design errors in die castings.
59. **Trim Presses**—Parker-Hannifin Corp.—Bulletin describes high speed hydraulic trim presses.
62. **Lubricating Equipment**—Pierce-Waller, Inc.—Information on lubricating, cleaning and cooling molds.
63. **Pots**—Pottstown Machine Co.—Brochure describes a line of melting kettles for lead, zinc, and aluminum industries.
66. **Powdered Metal Parts**—Reese Metal Products Corp.—16-page booklet shows design do's and dont's and gives limitations and advantages of powdered metal parts.
69. **Die Lubricants**—G. W. Smith & Sons, Inc.—Data File gives information on best uses of Die Slick and Plunger Slick for efficient lubrication.
70. **Die Casting**—Southern Die Casting & Engineering Co.—Information on technical planning and designing assistance for die casting.
72. **Pots**—Tiffin Foundry, Inc.—Brochure lists a complete line of stock pots and die casting machine accessories.
74. **Tool Steels**—Uddeholm Co. of America—Technical information on tool steels for die casting and extrusion.
75. **Investment Castings**—Vascaloy-Ramet Corp.—Data on investment castings made in metals to meet specific requirements.
76. **Temperature Control**—West Instrument Corp.—Bulletin describes Gardsmen controllers for all applications.
77. **Lapping Compound**—Wheel Trueing Tool Co.—Folder describes best applications and uses of Trulap lapping compound.
79. **Industrial Floor Cleaners**—Oakite Products, Inc.—Booklet shows how to plan an efficient industrial floor maintenance program.
80. **Electro-Coating**—Ransburg Electro-Coating Corp.—Brochure gives savings figures and detailed information on No. 2 Process Electro-Spray.
84. **Foundry Products**—The Joseph Dixon Crucible Co.—Brochure describes line including lubricants, crucibles, furnace linings, and many others.
85. **Powder Metallurgy**—Norwalk Powdered Metals, Inc.—Folder tells how to convert powdered metal into machine parts.
89. **Barrel Finishing**—Speed-D-Burr Corp.—Brochure gives full details on barrel finishing equipment and materials.
90. **Investment Casting**—Rex Precision Products, Inc.—"Design Guide" booklet tells how to design for investment casting through engineering consultation.
92. **Fire Resistant Hydraulic Fluids**—Union Carbide Chemicals Co.—Information on Ucon safety hydraulic fluids.
93. **Melting and Holding Furnaces**—J. A. Kozma Co.—Technical information on melting and holding furnaces.

Low-cost answer to hydraulic fluid safety... UCON Fire-Resistant Hydrolubes

ARE you running the risk of being burned out of business by a sudden hydraulic line break that sprays flammable fluid into a hot and hazardous area?

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UCON hydrolubes are balanced formulations of a water-soluble polyglycol thickener in an ethylene glycol-water base. Selected additives keep pump replacement costs low and provide maximum liquid and vapor-phase corrosion resistance. As long as water content is adequately maintained, UCON hydrolubes give complete protection from flash fires; they also have successfully passed 100 per cent oxygen atmosphere spray flammability tests.

UCON hydrolubes come in viscosity grades to meet all system needs and operating conditions. Their viscosity-temperature properties are better than those of other types of fire-resistant fluids and petroleum oils.

Conversion from flammable petroleum oils or non-aqueous fire-resistant fluids to fire-resistant UCON hydrolubes is quick and easy. No special packings and seals are required. In many instances, leakage loss is reduced.

For complete information on the economy and efficiency of UCON safety hydraulic fluids, and the simple conversion steps for your systems, call your CARBIDE Technical Representative, or write: Union Carbide Chemicals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, New York.

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UNION CARBIDE

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useful literature, catalogs, manuals *qualified readers may obtain*

any of these technical publications by circling the numbers on the reader service cards.

PROCESSES

151 *Investment Castings*—MISCO PRECISION CASTING CO.—Brochure discusses the application of high integrity investment castings made from aluminum alloys.

152 *Powdered Metal Parts*—MUELLER BRASS CO.—Technical booklet discusses the design of powdered metal parts, lists material properties.

153 *Extrusions*—MIDWEST ALUMINUM CORP.—Design and procurement data shows how small quantities of extrusions can be specified economically.

154 *Powder Metallurgy Parts*—KWIKSET POWDERED METAL PRODUCTS—Brochure lists the engineering properties of ferrous and non-ferrous powdered metal parts, shows typical applications.

155 *Plaster Mold Castings*—ATLANTIC CASTING AND ENGINEERING CORP.—18-page technical booklet tells how the plaster mold and planar investment casting processes are combined to overcome the limitations peculiar to each.

156 *Investment Castings*—PRECISION FOUNDERS INC.—Brochure shows how preformed ceramic cores permit the design of more intricately cored investment castings.

MATERIALS & EQUIPMENT

160 *Conveyors*—MAY-FRAN MFG. CO.—Catalog gives design and application data on a complete line of conveyors, including models for scrap removal that fit all standard machine tools.

161 *Permanent Mold Alloy*—AMERICAN SMELTING & REF. CO.—8-page technical booklet lists engineering data for a self-aging aluminum permanent mold casting alloy that provides high strength without heat treatment.

162 *Molybdenum*—SCHWARZKOPF DEVELOPMENT CORP.—57-page technical manual describes the properties, applications, and available forms of molybdenum.

163 *Magnesium Specifications*—THE DOW METAL PRODUCTS CO.—Bulletin lists the magnesium specifications issued by government procurement agencies and technical societies.

164 *Thermocouple Assemblies*—MINNEAPOLIS-HONEYWELL REGULATOR CO.—40-page catalog lists specifications and new price schedule for a line of general-purpose and special use thermocouple assemblies.

165 *Die Making Supplies*—D-M-E CORP.—External house organ shows a line of mold cutting and polishing equipment, lists important price reductions.

166 *Controller-Recorders*—MINNEAPOLIS-HONEYWELL REGULATOR CO.—4-page specification sheet describes a line of cam-operated program controllers-recorders.

167 *Pneumatic Cylinder*—HANNIFIN CO.—Bulletin describes single and double rod end pneumatic cylinders with floating cushions available for fast stroke or high shock conditions. Cut-away diagrams provide a guide to all features.

168 *High Strength Aluminum*—ALUMINUM SMELTING & REFINING CO.—Complete engineering data on a natural aging aluminum alloy with properties comparable to heat-treated castings.

169 *Gating Castings*—AMERICAN SMELTING & REFINING CO.—43-page technical article on the techniques of gating zinc die castings.

170 *Copper Powder*—MALONE METAL POWDERS, INC.—Bulletin describes Fernlock dendritic electrolytic copper powder.

171 *Drawer Type Ovens*—DESPATCH OVEN CO.—Technical data on forced convection, horizontal air flow, drawer type ovens.

172 *Layout Ink*—PERC E. HARMS CO.—Information on an aerosol lay-out ink available in blue, green, or red to meet specific requirements.

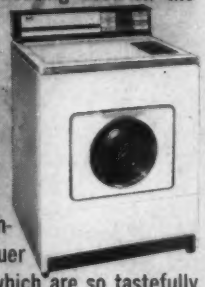
FINISHING

• ***Power Supplies***—THE MEAKER CO.—56-page book describes semiconductor power rectifiers for anodizing, electrochemical processing, and other industrial applications. Make request on company letterhead indicating whether electroplating or industrial power supply literature is wanted. 75 River Road, Nutley 10, N.J.

more on page 77

"Are you getting your metal's worth?"

Beauty is only skin deep—but you've got to have the right kind of skin to begin with. Take this stylish zinc die cast control panel housing used on the Kenmore combination washer-dryer.



Without the castability of Zamak you wouldn't be able to achieve the detailed decorative design and lettering cast in the smooth surface. And only the surface of a zinc die casting enables you to draw on the wide variety of finishing techniques—chrome plating, gold lacquer and white and charcoal enamel—which are so tastefully combined. • This panel housing is not a fragile beauty either. It has to be strong to endure a life filled with daily vibrations as the family laundry gets done. Design and production men are not easily charmed—they tried an anodized aluminum stamping—but they found it "too flimsy and not sharp looking." So much for that romance. • There are also some attractions related to this panel which are more than skin deep—the beauties of high production and interchangeable parts. Du-Wel Metal Products of Bangor, Michigan can consistently turn out up to 3000 of these castings a day, with variations in the right control box for different models of the washer-dryer. • **Remember—Zamak gives you more for less. Are you getting your metal's worth?**

NJZ

HORSE HEAD PRODUCTS

THE NEW JERSEY ZINC CO.
160 FRONT STREET • NEW YORK 38, N. Y.

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useful literature, catalogs, manuals

188 *Trim Press*—HAVIR MFG. CO.—Catalog sheet describes a new 25-ton automatic trim press designed for fast operation.

189 *Electroplating*—HANSON-VAN WINKLE-MUNNING CO.—8-page bulletin describes a line of anodes, anode accessories, and chemicals for electroplating and metal finishing.

190 *Drilling & Tapping*—WISCONSIN DRILL HEAD CO.—Bulletin describes a machine featuring fast changeover characteristics for drilling, tapping, boring, and reaming.

191 *Phosphate Coatings*—OAKITE PRODUCTS, INC.—4-page booklet describes an iron phosphating material for simultaneous cleaning and phosphating by tank application.

192 *Strippable Coating*—SPRAYLAT CORP.—Booklet describes a water base plastic strippable coating which cuts the cost of spray booth maintenance, discusses an actual plant evaluation.

193 *Rustproofing Oil*—ENTHONE, INC.—Technical data on a thin, organic liquid which provides temporary rustproofing for parts in process or in storage.

194 *Metal Purifier*—CONVERSION CHEMICAL CORP.—Data sheet lists information on a metal purifier concentrate used in cadmium plating solutions to tie up heavy metal contaminates.

195 *Vibratory Finishing*—ROTO-FINISH, INC.—Bulletin describes a vibratory finishing machine with compound recirculating system which prevents abrasive impregnation of processed parts.

196 *Welding Aluminum*—OAKITE PRODUCTS, INC.—8-page booklet discusses the removal of high resistance oxide films from aluminum preparatory to welding.

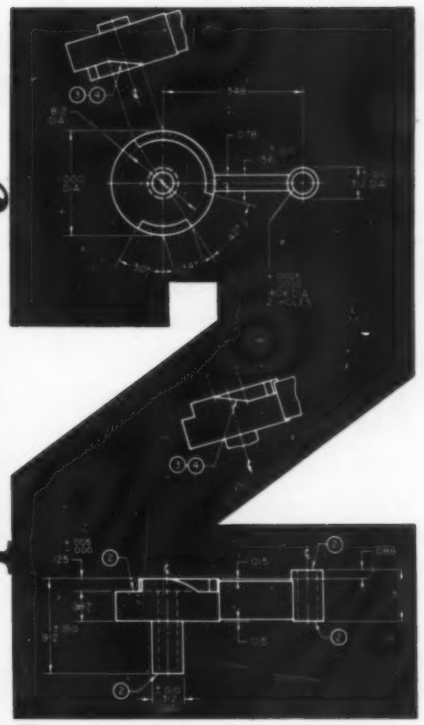
197 *Steam-Detergent Cleaning*—OAKITE PRODUCTS, INC.—Booklet presents an up-dated compilation of the most modern methods and materials now used in steam-detergent cleaning.

198 *Marking Machines*—ACROMARK CO.—7-page catalog describes a complete line of marking and numbering machines for identification and decoration.

199 *Chromium Plating*—WHYCO CHROMIUM CO.—Brochure of interest to those seeking custom plating services shows the advances made in chromium plating techniques.

200 *Drilling Machines*—BURGMASTER CORP.—16-page catalog describes automatic, hydraulic, turret drilling machines.

blueprint for



The blueprint shown above is for a phonograph motor toggle link pressed from brass powder by American Powdered Metals Inc. for the General Industries Company. Why blueprint for two? Because it combines 2 design functions—structural support and cam surface—in a single part. Because powder metallurgy is the only economically practical way to make this part—and it could not have been achieved without design teamwork between the customer and the metal powder fabricator.

Teamwork produced a precise, intricate part assuring exact turntable speed and providing a cam surface which controls speed selection.

The cam surface must be smooth and accurate—and stay that way. Holes must parallel and round to within .0005" total indicator reading. Hole centerlines must be parallel to each other within .002" T.I.R. Brass powder supplies the properties necessary for these requirements with its ideal combination of structural strength and self-lubrication.

Working together, the metal powder fabricator and design engineer make economical mass production of critical parts a reality. And we also mean "critical" in the sense that a whole is no better than the quality of its most prosaic part. For more information about the design, application and advantages of nonferrous metal powder parts, write today to The New Jersey Zinc Company for your copy of "Designing For Pressed Brass and Nickel Silver Parts."

HORSE HEAD® ATOMIZED NONFERROUS METAL POWDERS ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET • NEW YORK 38, N. Y.

DEVELOPERS OF BRASS & NICKEL SILVER POWDERS SETTING TODAY'S STANDARDS

HORSE HEAD PRODUCTS

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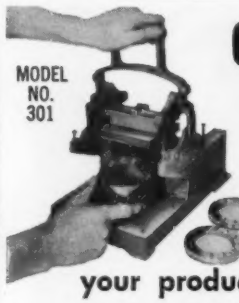

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Tedious hand filling, messy spraying and sloppy applications of color . . . are eliminated when you use the ACROPRINTER®.
We make a flexible die of ACROPRENE® to exactly match the cavity, depression and contour of your part or product, then set it in the ACROPRINTER® No. 301 or No. 401A . . . making your color filling operation a high production mechanical one that applies printing ink or enamel precisely and attractively.
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Model No. 301 is a hand operated machine adjustable for utmost perfection. Model No. 401A is the air-operated machine with that same precise touch and higher speed.

For FILLING or PRINTING, send a sketch, sample part or description with dimensions. Acromark Engineers will give you the full answer promptly, with illustrating data.

The ACROMARK Company
426 Morrell St., Elizabeth 4, N. J.
"The Original Marking Specialists"

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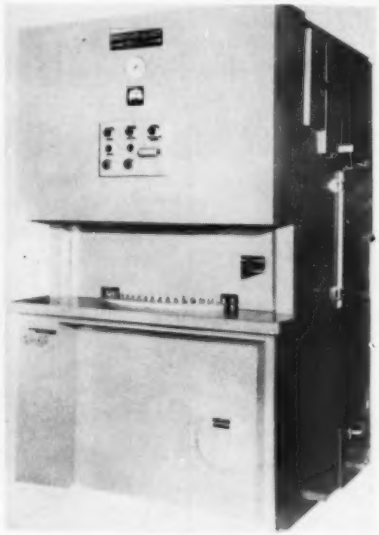
new products & developments

Continued from page 34

Automated standard wet blast unit

PRESSURE BLAST MANUFACTURING CO., INC.—Rotomatic, claimed by its makers to be the first standard automated wet blast unit, incorporates all facilities for workpiece movement, special tooling, and post wet blast operations such as rinsing, drying, etc. Five internal compartments can be fitted with whatever combination of blast guns, rinsing or drying facilities are necessary for any specific operation. Design of the rotary table allows either indexing or constant motion operation.



Circle No. **250** on Reader Service Card

Hexagonal wrenches

BOWERSOX PRECISION CASTINGS, INC.—The new Hex "T" Handle Wrenches have a specially designed handle for use in maximum-torque applications such as die casting die assembly. Included in the range of sizes available are the standard sizes necessary for this purpose. Size range varies from 5/64" to 5/8".

Circle No. **251** on Reader Service Card

more New Products on page 80

PICK A WINNER

ZINC AND ALUMINUM DIE CASTINGS

THE NEW JERSEY ZINC COMPANY'S

Zinc Die Casting of the Year

AWARD OF DISTINCTION

J. J. PUNKE
Cen-O-Matic Corporation
Syracuse, New York

For skillful and ingenious design utilizing the special properties of the Zamak zinc die casting alloys to their best advantage and the production benefits of the die casting process to their fullest extent.

JUDGES:

September 27, 1961

CAST-O-MATIC CORPORATION
Box 1172, Syracuse, N.Y.
Phone HEmpstead 7-8441

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PRECISION METAL MOLDING

Where Structural Qualities Are Most Important

ZINC DIE CASTING

OFFERS MORE IN

COMPACTNESS
STRENGTH
STABILITY

	ZINC SAE 903 ASTM XXIII (Zamac 3)	THERMOPLASTIC RESINS	
		POLYACETAL (Delrin* Type)	ABS (Cycolac† Type)
COMPACTNESS			
EQUIVALENT VOL. TO STRENGTH RATIO	1	2.4 X	2.8 X
STRENGTH			
TENSILE			
1000 psi @ 70°F	41	10	5.1 - 7.8
212°F	28	4.5 - 5.5	(@ 160°F) 2.9 - 4.6
IMPACT			
ft.-lbs./in. @ −40°F	2	1.2 - 1.8	1 - 2.5
@ 73°F	43	1.4 - 2.3	3 - 9
	Un-notched Charpy	Notched Izod	
COMPRESSION			
1000 psi	60	12 - 18	2.5 - 11
STABILITY			
COEF. OF LINEAR EXPANSION PER °F	.0000152	.000045	.000078 - .00010
WATER ABSORPTION 24 hr. Immersion in %	0	0.12	.2 - .3
MOLD SHRINKAGE in./in.	.004	.020	.005

ABOVE DATA COMPILED 9/61

ST. JOE

ZINC

99.99+%

ST. JOSEPH LEAD CO.

250 PARK AVENUE • NEW YORK 17, N.Y.

Plus these zinc die casting extras:

- Zinc is scratch resistant
- Zinc has far superior fatigue strength
- Zinc dies are easier to produce
- Zinc die casting has shortest moulding cycle
- Zinc can be machined by any method without fire hazard
- Zinc is highly resistant to stains
- Zinc can be readily colored and has excellent color retention

*REG. TRADE MARK OF E. I. DU PONT DE NEMOURS & CO. (INC.)

†REG. TRADE MARK OF MARBON CHEMICAL DIVISION, BORG-WARNER

ZH-303

Circle 33 on Reader Service Card

Circle No. 17 on Reader Service Card

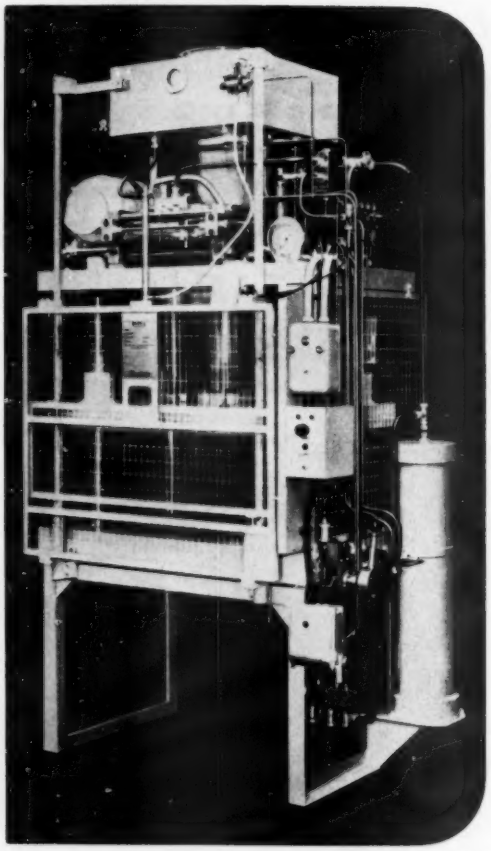
SPEED UP YOUR TRIM OPERATIONS!

Here's Bipel's 50-ton Semi-Automatic Trim Press that gives you a faster approach and a faster advance through the work! Dry cycle time is only 3 seconds. This flexible, clean-trimming unit offers a choice of 3 pressures . . . 17, 34 or 50 tons (intensified within the press) . . . semi-automatic or manual control. Complete operator safety, too. Write for illustrated bulletin.

B. I. P. ENGINEERING LTD.
Sutton Coldfield, England

RALPH B. SYMONS
ASSOCIATES, INC.
3569 Main Road, Tiverton, R. I.

BIPEL®

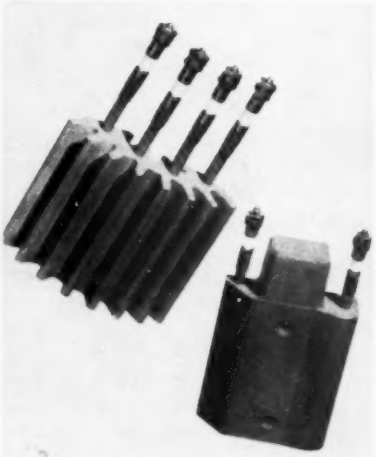


new products & developments

Continued from page 78

High wattage resistors

INDUSTRIAL HEATER CO.— These high wattage resistors have been manu-



5 TO 200 TON CAPACITIES (100 TON PRESS ILLUSTRATED)

DYNAPRESS 100

BRAND NEW...

and already the talk of the compacting field

An important advance in press design; cleaner, more efficient, more versatile. Dynapress features include: completely enclosed drive mechanism • hydraulically controlled floating die table • rugged, radial guiding on upper and lower rams • larger, more accessible die area • automatic lubricating.
Call or write:

MORTON MANUFACTURING COMPANY
Muskegon Heights, Michigan
BUILDERS OF QUALITY MACHINERY SINCE 1880

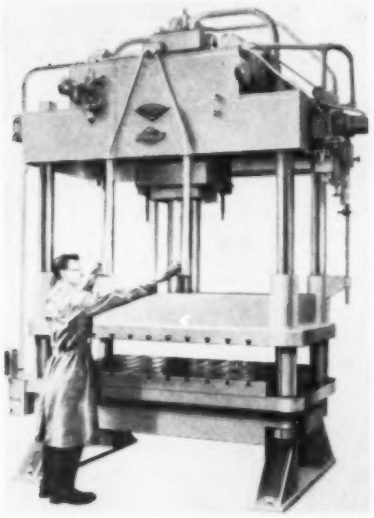
Circle No. 51 on Reader Service Card

factured to customer specification as high as 2000 watts, and have operated at 1000° F temperatures. The all metal and ceramic construction results in stable operation over wide temperature ranges, and under conditions of Mil-Std-202 environmental requirements. These resistors have been used on missile auxiliary power systems, and field reports show excellent service.

Circle No. **243** on Reader Service Card

100 ton hydraulic trim press

B & T MACHINERY CO.—This new 100 ton 4-bar trim press is equipped with an adjustable deceleration valve, and is hydraulically operated. A fast approach velocity of 900 I.P.M. and a return speed of



875 I.P.M. give high speed production, while a slow trimming action of 59 I.P.M. produces neatly sheared, clean castings. The machine has a 30″ stroke, and features safety stops on the tie bars.

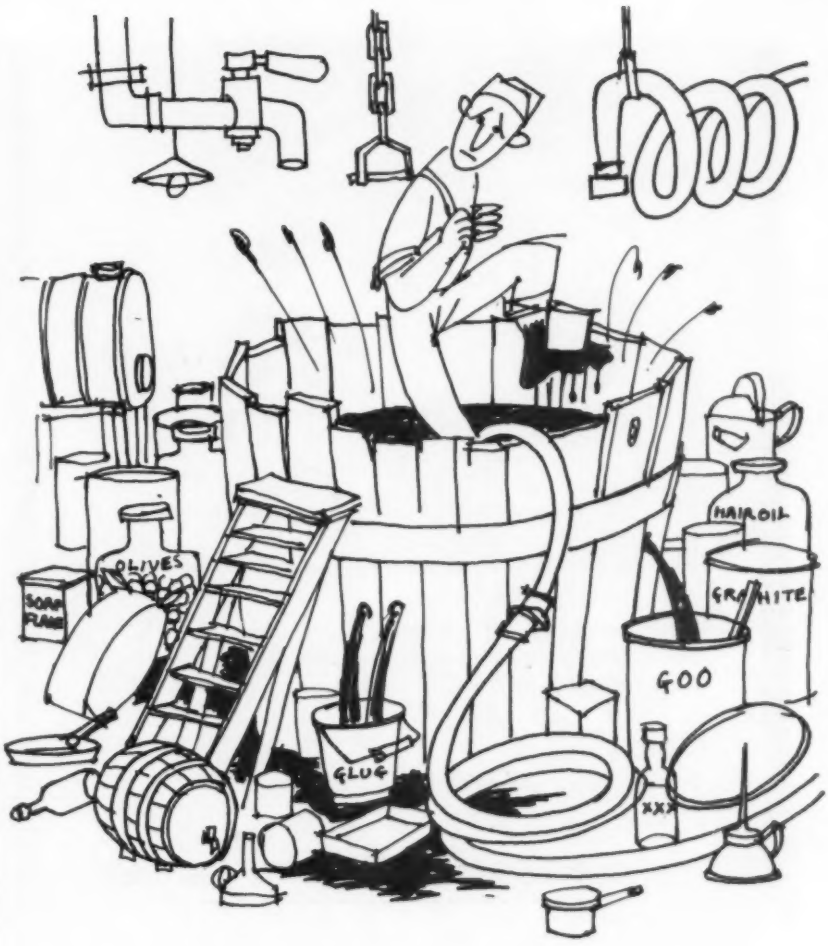
Circle No. **244** on Reader Service Card

Gage measures thin films

TWIN CITY TESTING CORP.—An inexpensive electronic thickness gage measures metal films as thin as one ten-millionth of an inch. The unit, called a backscatter gage, uses beta ray radiation to make rapid, accurate measurements.

Circle No. **245** on Reader Service Card

more New Products on next page



Don't press your luck... use Die Slick!

Die casters everywhere use Die Slick and Plunger-Slick compounds because they work—on easy as well as difficult jobs—on aluminum, zinc, magnesium, brass and lead. New 600 Series Die Slick compounds are providing the ultimate in release properties, without buildup on the die, in zinc and aluminum casting. No. 9-X Die Slick continues to set new records for dilution economy (to 20 parts water on some zinc jobs). No. 625 ready mix for zinc is earning wide and enthusiastic users in production shops. Plunger-Slick No. 41 stays on the plunger instead of on the floor, to cut plunger lubricant bills by ½ or ⅔. So why make your own?

Whether you are a methods engineer or a foreman we invite you to send for the Die Slick Data File today.

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for 20 years

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC.,
1703 SPAULDING ROAD, DAYTON 32, OHIO

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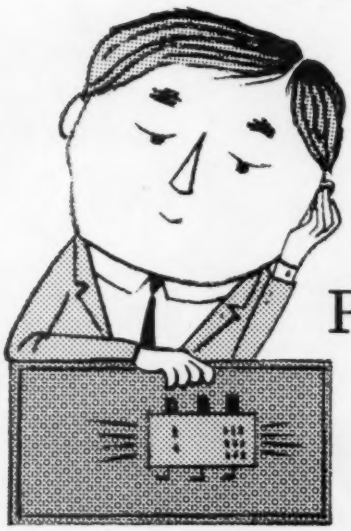
Circle No. 15 on Reader Service Card



wish I HAD a PENNY for every CLICK . . .

When an Electrical Control Device clicks through its 100,000,000th operation, there's probably a BADGER DIE casting involved!

BADGER DIE CASTING CORP.
201 W. Oklahoma Avenue, Milwaukee 7, Wisconsin

SELLERS OF

'METALKAT'
BRAND ELECTROLYTIC **ZINC**
SPECIAL HIGH GRADE 99.995% +
HIGH GRADE 99.95%

INDUSSA CORPORATION
511 Fifth Avenue New York 17, New York Tel: MUrray Hill 2-4680

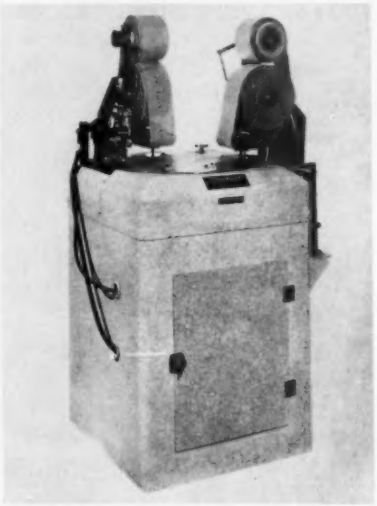
Circle No. 38 on Reader Service Card

new products & developments

Continued

Finishing machine

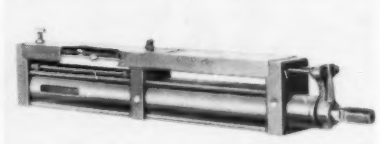
CONFORMING MATRIX CORP.—A new machine for the automatic finishing of dials, emblems, and various piece parts, wherein the first or second surface depressions are to be filled and then wiped or polished, has a



rotary index table with eight spindles. These spindles spin in five stations and are available for loading or unloading in three stations. The table is equipped to accommodate any combination, up to five, interchangeable accessory heads, including a fill head, a smear wipe, a full wipe, a light buff, and a painting head.

Circle No. **246** on Reader Service Card

Air-hydraulic actuators

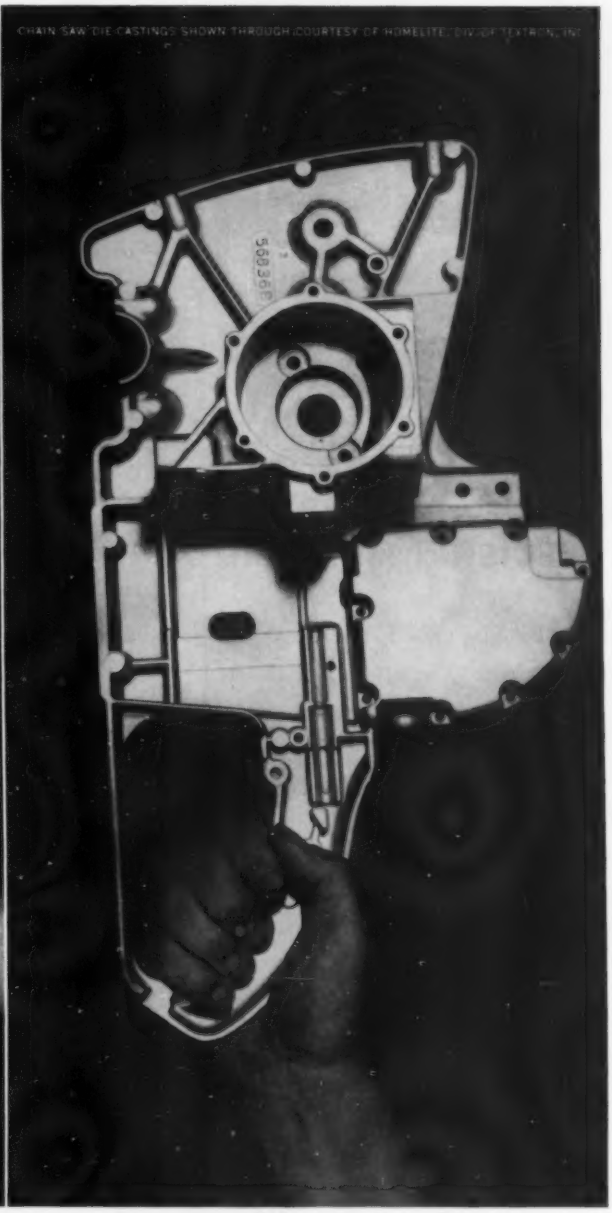


ELECTRO-MECHANO CO.—In line construction provides smooth linear motion from air pressure with this air operated, hydraulically controlled cylinder. The units are available with control inward, outward, or in both directions.

Circle No. **247** on Reader Service Card

more New Products on page 84

Multi-part assembly...



or "assembly in the die?"

WHICH PROVIDES THE COST-CUTTING EDGE FOR YOUR PRODUCT?

If your product involves the assembly of two or more related metal parts, the chances are you can make important savings and a better product by having assembly "done in the die." Skilled one-piece die casting by Doehler-Jarvis cuts tooling and metal costs to the bone . . . saves you time and money at every assembling and joining stage. You save on rejects, too — in one-piece die casting, there are no such things as mismated parts. We call it UNITATION . . . the unique Doehler-Jarvis combination of unitizing and automation that produces the part you want in a single, strong casting. To learn how you can benefit from UNITATION, why not let an experienced D-J engineer take a hard analytical look at your cast, formed or assembled metal parts. His suggestions may save you thousands of dollars. Write or call.

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DIVISION OF NATIONAL LEAD COMPANY

GENERAL OFFICES: TOLEDO 1, OHIO. PLANTS AND SALES OFFICES: TOLEDO, OHIO; GRAND RAPIDS, MICHIGAN; POTTSTOWN, PENNSYLVANIA; BATAVIA, NEW YORK. IN CANADA: BARBER DIE CASTING CO., LTD., HAMILTON, ONTARIO. IN BRAZIL: INDUSTRIAS DOEHLER DO BRASIL, S. A., SAO BERNARDO DO CAMPO, SAO PAULO. IN ARGENTINA: DOEHLER ARGENTINA, S. A., BUENOS AIRES. IN GREAT BRITAIN: METAL CASTINGS-DOEHLER, LTD., WORCESTER, ENGLAND.

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SAVES 80% ON PRECISION FINISHING

Speed-D-Burring saves up to 80% on metal finishing costs... because it provides the precision finish of the finest surface grinder at the low cost of barrel finishing... on components of varied size and shape... on small jobs or production runs... with exacting finishes ranging from normal to as low as .0001 tolerance and 1 micro-inch finish. Check these important facts on the **complete** superiority of Speed-D-Burring:

Complete Equipment... from compact to heavy barrel finishing units for all jobs... for large and small plants.

Complete Materials... widest range of abrasive media and compounds precision blended for each operation.

Complete Service... experienced technical staff at your service for test runs through production jobs.

New Speed-D-Burr brochure– gives full details on Barrel Finishing Equipment and Materials. Free engineering consultation is also available on any metal finishing problem.

SPEED·D·BURR
Division of Coleman Engineering

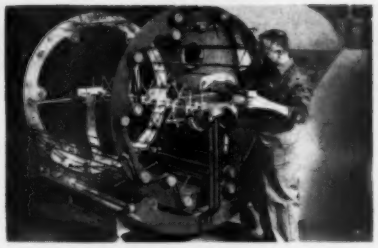
231 EAST LOMITA BOULEVARD
WILMINGTON · CALIFORNIA

Circle No. 89 on Reader Service Card

new products & developments

Continued from page 82

Vacuum metallizer



F. J. STOKES CORP.—Three major design improvements have been made in the newest version of the Model 427-6, 72" vacuum metallizing system. The work-holding planetary carriage has been redesigned for maximum rigidity to stand up under round-the-clock operation. It also has greater loading capacity. A new type 30 kva power supply achieves faster metal evaporation. A change in the pumping system provides larger gas handling capabilities.

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wax extruding fabricators for the Investment Casting Trade

- Filter and extrude your reclaimed wax to your particular requirements
- New sprue wax extrusions in all sizes
- We do specialty wax blending to your specifications
- Also potting and encapsulating waxes

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Burbank, California
Victoria 9-4608

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One source for . . .

ALL METAL POWDERS

Aluminum to Zirconium

Distributors for

- **VASCO prealloys**
- **NEW JERSEY ZINC brass**
- **WHITAKER copper**
- **UGINE cobalt**

HARDY METALS — SERVING INDUSTRY ALL OVER THE WORLD

Charles Hardy·Inc.
420 LEXINGTON AVE.,
NEW YORK 17, N.Y.

PHONE: LEXINGTON 2-4224

THIS TRIGGER is your control over mold cavity surfaces - cleans, cools, lubricates in *ONE OPERATION*

SELF-AGITATING LUBRICANT CONTAINER

Get more usable castings with the P-W SYSTEM—universally accepted throughout the die casting industry.

GUN UNITS AVAILABLE SEPARATELY

Write for additional information to

PIERCE-WALLER, INC.
KETTERING P. O. Box 2121
DAYTON 29, OHIO

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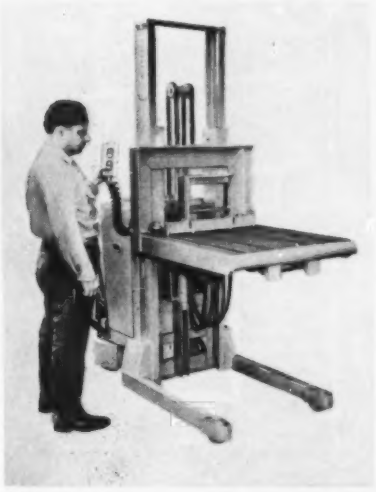
PRECISION METAL MOLDING

Die handler truck

ECONOMY ENGINEERING CO.—The Walkie-Worklifter Die Handler combines both lifting and horizontal powered travel with powered movement of heavy dies on and off the load platform deck. It has been specifically made for medium weight loads up to 2000 pounds for



operating in congested areas, and is battery operated with a two-speed drive unit. A hydraulic pump lifts and lowers the load platform, and a separate hydraulic circuit powers a double acting ram which is chain connected to a pusher bar on top of the platform.

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Miniature end brushes

WEILER BRUSH CO., INC.—Scratch-Gard, a series of new nylon head (ferrule) miniature end brushes, is reported to eliminate scratching

when polishing delicate surfaces. They are available in 3/16″, ¼″ and 5/16″ inside diameter ferrule sizes, and in 3/32″ and ⅜″ stem diameter sizes. A wide choice of fill material is available.

Circle No. **252** on Reader Service Card

more New Products on page 87

To make the BEST...

Begin with the

BEST CASTINGS!

Latrobe Die Casting Co

Aluminum Alloy Castings

Zinc Alloy Castings

Tin and Lead Alloy Castings

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DAYTON, OHIO
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333 W. First St.
Tel: Baldwin 6-3418

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Jay K. Esler
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Tel: Trinity 3-5910

NEW ENGLAND
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P.O. Box 77
Old Saybrook, Conn.
Tel: Evergreen 8-9833

PHILADELPHIA, PA.
Albert B. Reid
505 Wadsworth St.
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Latrobe Die Casting Co.
Latrobe, Pennsylvania

Established 1918

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LET

Superior

DEVELOP YOUR ALUMINUM "TRIM IDEAS"

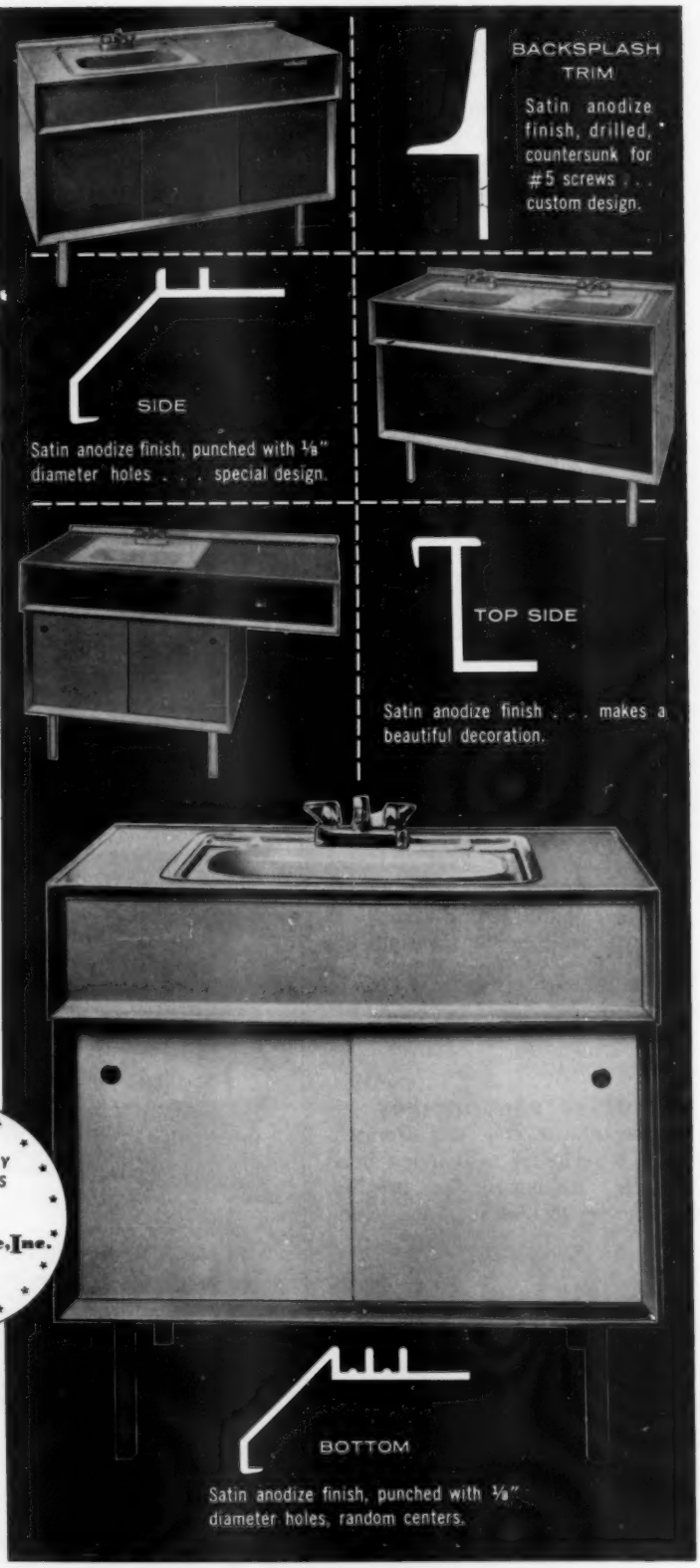
Here's how one company used Superior Industries' engineering services and production facilities in planning its metal trim requirements for a new product.

. . . and it wound up with beautiful, special designs to match functional and decorative requirements of an exquisite AllianceWare lavatory vanity.

Peter Muller-Munk Associates designed the AllianceWare vanity and also the aluminum trim. Superior was called upon to meet the specifications and match uncompromising mechanical accuracy and finish.

Under one roof, Superior miters, bends, rivets, drills, countersinks and notches the metal. Chemical and hand polishing, spray painting, and anodizing get professional attention.

Thousands of companies have used Superior's facilities. So give it a try . . . send samples, blueprints or ask us to call.


BACKSPLASH TRIM
Satin anodize finish, drilled, countersunk for #5 screws . . . custom design.
SIDE
Satin anodize finish, punched with ⅛" diameter holes . . . special design.
TOP SIDE
Satin anodize finish . . . makes a beautiful decoration.
BOTTOM
Satin anodize finish, punched with ⅛" diameter holes, random centers.
LAVATORY VANITIES BY AllianceWare, Inc.

ALUMINUM EXTRUDERS • ANODIZERS • ARTRIM MOULDINGS

SUPERIOR INDUSTRIES INC.

3788 OAKWOOD AVENUE • YOUNGSTOWN, OHIO

Circle No. 71 on Reader Service Card

BUYERS' GUIDE FOR PMM PARTS

THIS DIRECTORY is a listing of the local sales representatives of major custom fabricators. It is presented in conjunction with this buying practices issue as a service to the buyers of powder metallurgy parts, extrusions, and permanent mold, plaster mold, investment, and die castings.

The listings are catalogued according to state and manufacturing process. They tell at a glance which fabricators are represented in your area and who represents them. Areas covered by the representatives tend to be based on physical distances rather than state boundaries. Therefore, buyers are urged to consider also those representatives located in nearby adjoining states. Physical considerations have made it impossible to define the precise area covered by each representative.

ALABAMA

Investment Casting

Misco Precision Casting Co.
D. B. McLay, Southern Dynamics, Inc., P. O. Box 598, 3 Homewood Br., Birmingham 9

ARIZONA

Investment Casting

Misco Precision Casting Co.
Bruce Irwin, 30 Pima Plaza, Scottsdale

Rex Precision Products, Inc.
Kiva Sales Co., 5614 E. Thomas Rd., Phoenix 18

Powder Metallurgy Parts

Asco Sintering Corp.
John Lowry, 7412 Bonita Drive, Scottsdale

Mueller Brass Co.
Charles L. Treend, Suite 420, Guaranty Bank Bldg., 3550 N. Central Ave., Phoenix 12

Impact Extrusions

Mueller Brass Co.
Charles L. Treend, Suite 420, Guaranty Bank Bldg., 3550 N. Central Ave., Phoenix 12

CALIFORNIA

Die Casting

Withrow Die Casting Co.
Joseph L. Haber, 13164 Leadwell St., North Hollywood

Withrow Die Casting Co.
Marvin Mattis, 172 N. Almont Dr., Beverly Hills

Withrow Die Casting Co.
Steve McLeod, 3030 Bridgeway, Sausalito

Investment Casting

Arwood Corporation
L & L Associates, 4444 Piedmont Ave., Oakland

Arwood Corporation
Pacific Component Sales Co., 315 W. 9th St., Los Angeles

Arwood Corporation
George Warde, 825 N. Mountain View Place, Fullerton

Hitchiner Mfg. Co.
R. A. B. Williams Steel Co., 7046 Hollywood Blvd., Los Angeles 28

La Donn Precision Investment Castings
Joe Friedman, 12337 Branford St., Sun Valley

Misco Precision Casting Co.
Martin P. Tregnan, 6253 Hollywood Blvd., Los Angeles 28

Misco Precision Casting Co.
Garren Rea, Autodyne Engineering Co., 407 Francisco St., San Francisco 11

Misco Precision Casting Co.
J. Patrick Kelly, 10282 Belcher St., Downey

Rex Precision Products, Inc.
Robert C. Nicol, 11825 Major St., Culver City

Rex Precision Products, Inc.
Michael Gladstone, 1407 Niagara Ave., Claremont

Rex Precision Products, Inc.
F. Vincent Johnson, 22221 Flanco Rd., Woodland Hills

Vascoloy-Ramet Corporation
Edward Morrison, 1306 Bidwell Ave., Chico

Vascoloy-Ramet Corporation
R. C. Ingram, 6027 Atlantic Blvd., Maywood

Permanent Mold Casting

H & S Metal Products Co.
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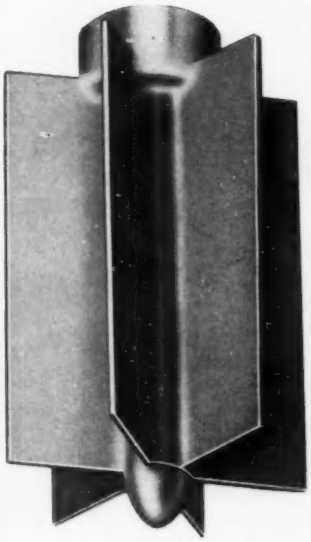

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Scrap and foundry returns melted with less than 1% loss

You can produce metals of high quality and controlled analysis from materials of the lowest grade. For both ferrous and nonferrous applications, these systems are available in capacities up to 30 tons.

No products of combustion or impurities added during melt

No products of combustion, sulphur or other impurities are added during melting or pouring. The furnaces are completely covered at all times and metal is poured from beneath the surface.

Controlled stirring for even blending – added strength

The electrical induction currents used to heat the charge also give a *controlled* stirring action which completely homogenizes the melt. Controlled stirring also reduces porosity and produces fine-grained iron of high strength and good machinability.

For nonferrous melting this controlled stirring results in a quiet bath with no turbulence at the metal surface. Oxidation and gas absorption are reduced. For brass melting, zinc losses are held to a minimum.

Low power consumption for low operating costs

The Hevi-Duty Tagliaferri induction furnaces use electrical power efficiently. These furnaces have a higher uncorrected power factor than competitive induction units. Thermal efficiency is about 78%.

Furnaces can start from cold – shells are interchangeable

Melting furnaces start from cold. No hot metal is needed. When it is necessary to change alloy or to interrupt operation, furnaces can be emptied completely.

Maintenance and cleaning are simplified

The channels in the non-ferrous furnaces are *easy* to inspect or clean; simply tilt the furnace forward and open the channel doors. A heel of molten metal can be left in the furnace during cleaning

Relined furnace shells can be installed without disconnecting electrical or hydraulic equipment.

HERE'S WHY YOU'LL LIKE THE RECEIVERS

Increased tensile strength after 20 minutes

Hevi-Duty Tagliaferri electric induction receivers take metal from the cupola and, in 20 to 30 minutes, homogenize it to produce iron of higher tensile strength.

Improved machinability

Metal refined in these receivers is fine-grained with a uniform structure resulting in good machinability.

Fluidity of metal increased by receivers – lower pouring temperature possible

Mold details fill more completely. Thinner sections can be cast successfully. And, products can often be redesigned to use less metal.

No loss of alloy

Alloying is accomplished in Hevi-Duty Tagliaferri receivers without loss of alloys. Raw iron from the cupola can be held in the receiver and analysis carefully controlled. Holding is possible for as long as 48 hours without analysis change.

Temperature controlled closely

Temperature can be adjusted within the receivers to best suit pouring conditions. Proper metallurgical analysis can be achieved. Steel scrap can be added to adjust the chemistry.

Get the full details

For information on Hevi-Duty Tagliaferri systems contact your nearest Hevi-Duty sales engineer or write Hevi-Duty Electric Company, Watertown, Wisconsin. Request Ferrous Bulletin 6051 — or Nonferrous Bulletin 6052.

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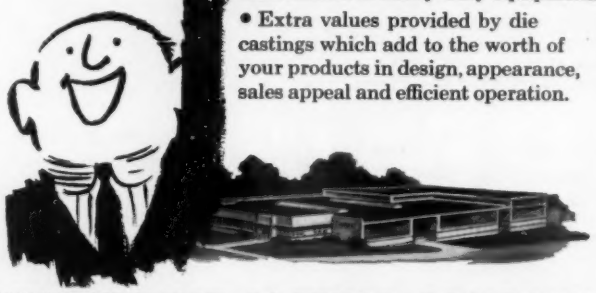

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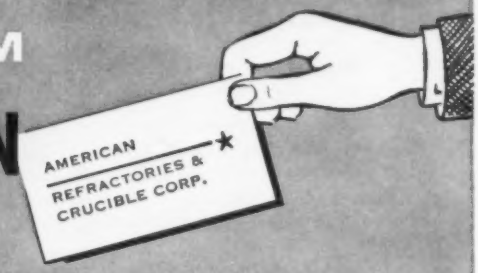

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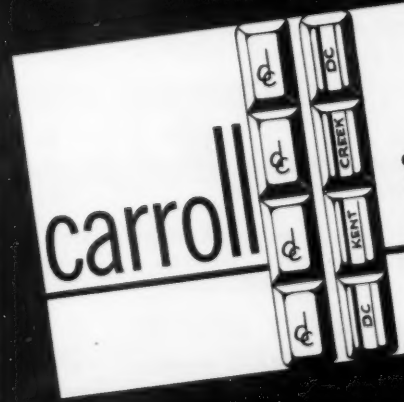

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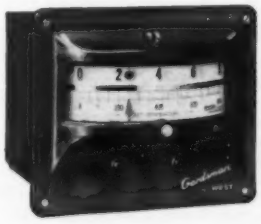

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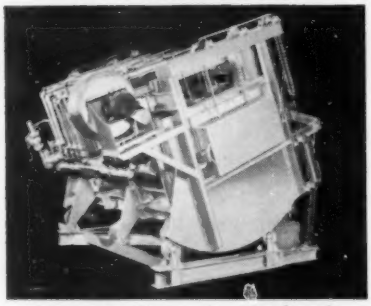

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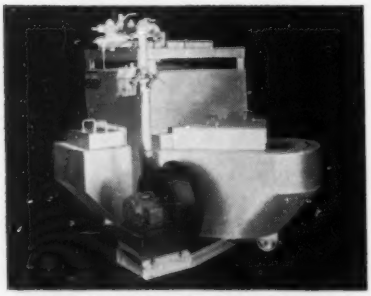

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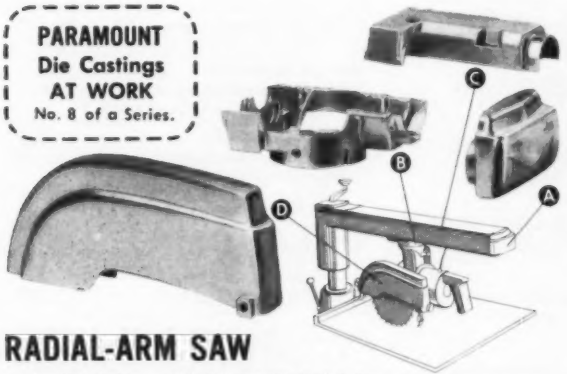

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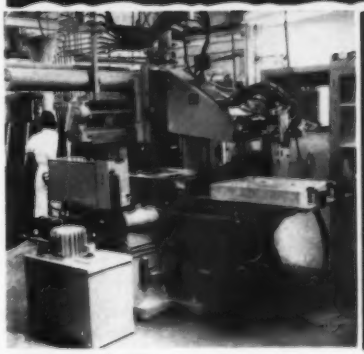

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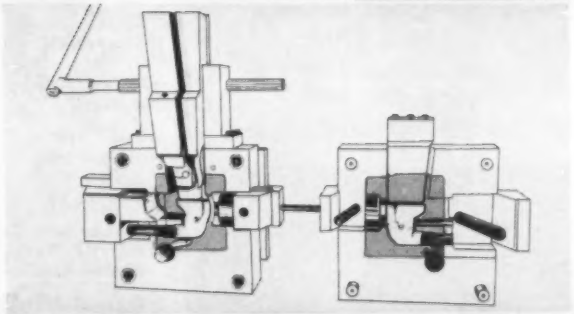

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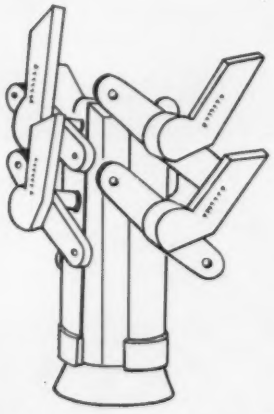

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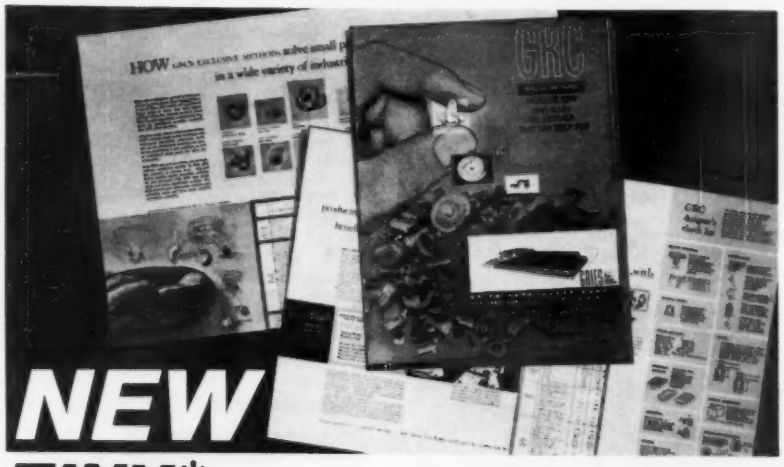

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The Detroit Free Press

Thursday, Oct. 19, 1961 — On Guard for 130 Years — Vol. 131—No. 168

$500,000 Fire Rips Die Plant

BY RILEY MURRAY AND DALE ARNOLD Free Press Staff Writers

A three-alarm fire destroyed the interior of the Valley Die Cast Corp. Wednesday night, causing $500,000 damage.

Twenty-one workers on the afternoon shift escaped safely as the flames, fed by flammable hydraulic fluid, spread through the factory, at 1791 Bellevue.

Firemen had the blaze under control within 30 minutes, but not before flames had roared through the roof of the one-story building, causing it to cave in.

• • •

ELMER BYRGE, 31, of 1208 Lycaste, die cast form foreman on the afternoon shift, said the fire started at about 7:30 p.m. when a hydraulic line on a die cast machine burst.

Byrge said the hydraulic fluid squirted into a 500-gallon pot of zinc that had been heated to 800 degrees.

"There was a flash of flame and the fire just spread from one machine to another," Byrge said.

The employes ran to safety through a truck-loading entrance and Byrge went to the main office to call the fire department.

"I just was able to get the call through before the phone went dead," he said. "When I got finished, the fire was so bad that I had to climb out a window to get out."

• • •

MURRAY ROBERTSON, 43, of 708 Lakepointe, Grosse Pointe Park, vice president and general manager of the firm, was at work in another part of the factory when the fire started.

He made the damage estimate, basing it on a large inventory on hand in the plant and the loss of all machinery as well as damage to the building.

Valley Die Cast makes die castings for the Chrysler Corp. and the Ford Motor Co.

Another factory, Bellevue Plating Co., 1839 Bellevue, which is next to the burned-out building, was damaged by smoke.

The three alarms brought 30 pieces of fire equipment to the scene as well as about 1,000 sightseers.

A NEW FIRE RESISTANT FLUID

By **EDWARD NORMAN**, *Mgr. Industrial Lubricants Dept., Hulburt Oil & Grease Co.*

A BROKEN OIL LINE can act just like a giant flame thrower—yet a survey of the die-casting industry showed that only slightly more than half of all die casting shops are using fire resistant hydraulic fluids. The hazard of petroleum fluids has been demonstrated time and time again by tragic accidents.

Why don't more die casters convert to fire-resistant fluid? Primarily costs. The shop owners think fire resistant fluids are too expensive.

Economics of Fire Resistant Fluid

The phosphate ester and phosphate ester base fluids may cost from 7-10 times the price of petroleum oil. Conversion procedures including reservoir paint removal and complete changeover of packings and seals to elastomers compatible with phosphate esters.

The water-glycol fluids may cost 5-7 times as much as oil. While they do not require packing changes in most cases, they are not compatible with many types of filters, and require demineralized water for make-up purposes. Water-glycol fluids should not be used where temperatures in excess of 125°F are experienced.

Water-in-oil emulsions of the conventional, chemically emulsified type are relatively low in cost, less than 3 times the price of petroleum oil. They require minimum conversion procedures, but do have some disadvantages. Chemical emulsions must be protected against high and low temperatures and contamination by other fluids to prevent water separation or emulsion inversion.

A new fire resistant hydraulic fluid which does not suffer from the economic disadvantages of present fluids is needed. Such a fluid has recently been placed on the industrial market after two years of extensive testing and use in hydraulic equipment in the coal mining industry.

Mechanical Emulsion Fluid

The new fluid is a mechanical emulsion, similar to the chemical emulsions, but the water is dispersed in oil.

The chemical emulsions employ a balance of oil-seeking and water-seeking organic chemicals to hold water dispersed in oil. The mechanical emulsion uses a finely divided solid, inert, inorganic lubricant similar to an inorganic grease thickener. Since the mechanism by which the water is held within the oil is physical rather than chemical, the mechanical emulsion is not sensitive to $_{p}H$ changes, contamination, freezing, etc. It is impossible to invert or completely separate the water from a mechanical emulsion by any known chemical means.

Storage

Outside storage in cold weather, impossible with chemical emulsions, is feasible with mechanical emulsions.

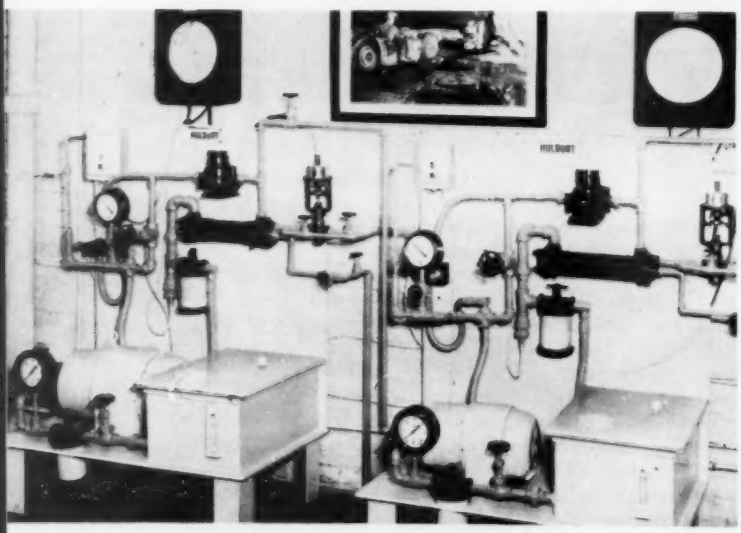
Drums of mechanical emulsion have been stored outside for an entire winter in Western Pennsylvania, undergoing repeated freezing and thawing without any water separation taking place.

Cost

The price of the mechanical emulsion is slightly lower than that of the chemical emulsions, but the cost of using the emulsion is far lower. This is made possible by the drastic reduction in leakage experience when a system is converted to mechanical emulsion. Depending on the system and how much fluid is lost through hose breaks and other large leaks, this reduction will be anywhere from 25-65%. In many cases, this reduction in leakage will result in a cost saving over the use of petroleum oil.

Fire Resistance

Mechanical emulsions, as do all water containing fluids, derive their fire resistance from their water content, and are similar to other water containing fluids in this respect. The new fluid has been tested by the U.S. Bureau of Mines for fire resistance and has been awarded U.S.B.M. Approval #30-4 for use in mining equipment where a fire hazard exists. Because of their water content, all emulsion fluids are limited in maximum operating temperatures to 180°F.



PUMP LIFE and packing compatibility are tested on this laboratory set-up.

Performance

Performance of the mechanical emulsion in hydraulic systems is similar to that of oil. The mechanical emulsion has been tested and used in all types of hydraulic pumps, vane, gear and piston, and results in every case have been excellent. A test was recently conducted for 2800 hours in a piston pump at 3000 psi using the mechanical emulsion. The volumetric efficiency of the pump at the finish of the test was identical to that at the start indicating that negligible wear had occurred. Laboratory tests in vane type pumps have given reproducible results which show that the mechanical emulsion is equivalent in lubricity to high quality petroleum oil.

Another operating advantage obtained with the mechanical emulsion is the low rate of evaporation of water from the fluid. The rate of water loss from the mechanical emulsion is less than half of that from a chemical emulsion. This is once again, due to the mechanical nature of the dispersion of the water as opposed to chemical dispersion.

The mechanical emulsion appears to be rather high in apparent viscosity, but the fluid is thixotropic. Its viscosity reduces under shear, so that as far as performance in a pump is concerned, it may be considered equivalent in viscosity to a 200 second petroleum oil.

Conversion

Conversion to a mechanical emulsion is neither expensive nor time consuming. Regardless of the fluid in use, all suction strainers smaller than 60 mesh should be replaced by strainers of 60 mesh or larger. All paper cartridge return line filters should be replaced by metallic or felt elements. A mechanical emulsion is filterable at least down to 5 microns, and is passed through a 5 micron felt filter prior to shipment from the manufacturer's plant. However, the water in the emulsion has a deleterious effect on paper, which is the reason for removing all paper filters.

If the fluid presently in the system is petroleum oil, water-in-oil emulsion or water glycol, all that remains to be done is to thoroughly drain the system, fill with a minimum quantity of mechanical emulsion, cycle the machine several times, drain the flush charge, and fill with fresh emulsion.

In systems where good drainage is possible, it may be possible to eliminate the flushing step. In caes where this is contemplated, it is best to consult the emulion manufacturer to determine what possible effect the emulsion might have on the fluid in use.

Where phosphate ester or phosphate ester base fluids are in use, a change in packings, seals and other rubber components is normally required, although it is possible that the rubber components in use may be of the universal type, that is; compatible with both phosphate ester and petroleum. Again, in such cases, the emulsion manufacturer should be consulted.

As is the case with other fluids, phosphate ester containing systems should be flushed with a minimum quantity of emulsion prior to installation of emulsion. Here too, with certain phosphate ester fluids, the flushing step may be eliminated.

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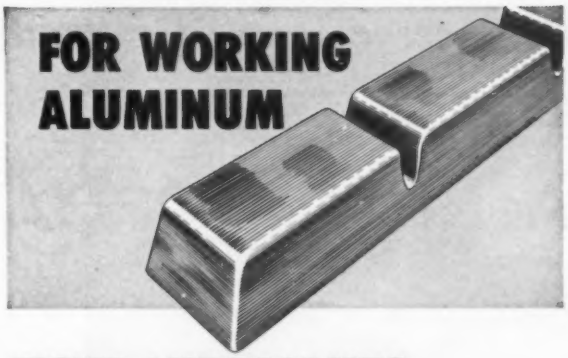

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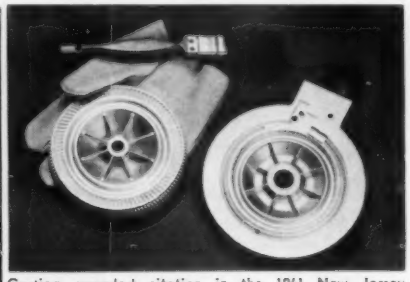

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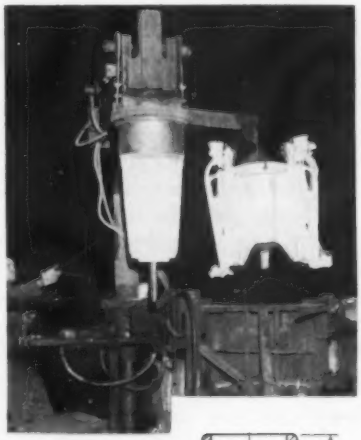

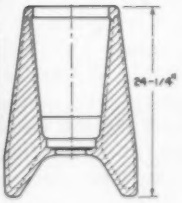

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Engineered materials handling gives . . . .

A NEW APPROACH TO DIE CASTING

HOT METAL, cast parts and trim scrap are all handled automatically in the new die casting plant built by Veeder-Root.

Because this is a new plant, the engineers could lay out the plant for the most efficient handling in the die casting division. Past practice was no limitation and there were no existing installations to hamper efficient flow of materials. The recommendations of the company and the suggestions of the equipment manufacturers were considered, but were not binding.

Specifications for the new die casting department called for capacity to service 30 die casting machines with associated trimming and deburring facilities. A plant of this size would be big enough to take care of the company's needs and do some jobbing work.

Melting facilities

The plant has a twin set of two fixed, 7,000 pound holding furnaces and two hydraulic-tilting, 6,000 pound alloying furnaces. All furnaces are gas-fired and have automatic temperature control. Trim scrap and sprues are fed back to the holding furnaces for re-melting.

Molten metal is pumped from either holding furnace into either alloying furnace with a Milles centrifugal pump. The discharge pipe from the pump is swiveled, so that it can be directed into either alloying furnace. Originally, this delivery pipe was externally heated to prevent metal freezing. This was not necessary and the discharge pipe lasted longer when no external heat was used. There was also a nice saving in gas.

Slab zinc and the necessary alloying materials are charged into the alloying furnaces. Molten scrap is transferred from the holding furnaces and the combined furnace charge thoroughly mixed with a power mixer. The melt is then analyzed, spectrographically, and the necessary adjustments made to bring the melt to exact composition.

Spectographic analysis

A complete analysis can be made in less than five minutes. This includes the time required to take the sample, send it to the laboratory, prepare the sample for analysis and do the actual analytical work. The spectrograph was designed and built by Baird-Atomic, Inc. It is installed in a completely air conditioned room. The unit, installed, cost about $40,000.

When a sample is received from the melting floor it is prepared for analysis on a small bench lathe, put into the spectrograph and the analysis shows on direct reading dials. The time required for this analysis is in sharp contrast to the hours, even days, formerly required for the same analysis when wet chemical methods were used.

The casting shop

At present fifteen die casting machines are installed. They range in size from 50 tons to 400 tons locking pressure. All of the machine holding pots are gas fired and have automatic temperature control. The machines are arranged in a single line with one holding furnace servicing two casting machines. A monorail conveyor runs the length of the line, carrying two electric hoists. The hoists handle the bull ladles of 1,000 pounds capacity each.

When a machine operator needs more metal he throws a switch which signals the furnace operator. The furnace operator puts a bull ladle into a small furnace to preheat it before metal is poured in. When the ladle is hot, the alloying furnace is tilted and the molten metal poured into the ladle. The metal is then transported on the monorail to the furnace which called for metal.

Cast parts go from the machines, travel to the trim presses on flatbed, open-mesh conveyors approximately 25 feet long. The movement of the conveyor can be controlled by either the casting machine operator or the trim press operator. By the time the gates of castings have reached the trim press they are cool enough to handle.

Almost all of the trim presses are Denison Multipresses. They are mounted on casters for easy shifting, depending on the particular job to be handled.

Trim dies are designed to afford minimum handling. In many cases eight or more castings are trimmed at a single press stroke. All trim presses are equipped with safety devices so that any foreign elements, other than the gates of castings, will stop the press automatically. With the safeties used, harm to the press operator is avoided as is damage to the trimming dies.

Handling the castings

Large die castings, after trimming, are hung on specially designed carriers on an endless, chain conveyor. The first stop is for hand deburring. The operator removes the castings from the conveyor, deburrs

AUTOMATION

HOLDING FURNACE receiving charge serves two die casting machines.

MOLTEN METAL being poured into a ladle from an alloying furnace for delivery to the die casting machines.

ALLOYING FURNACES are of the hydraulic-tilting variety. All metal undergoes spectographic analysis.

them and then hangs them back on the conveyor which takes them to the machining area. Color coding is used to distinguish the deburred parts from the rough trimmed parts. From deburring the castings go to machining and then to assembly. The transfer from machining to assembly is by a separate conveyor which is similar to the one which runs through the trimming, deburring and machining areas.

Small castings, after trimming, are put into tote pans and are moved to deburring, machining and assembly by lift trucks.

Scrap disposal

Trim scrap drops from the press, through a chute to a vibrating conveyor in a trench. There are two conveyors, one for each end of the casting line. Scrap is carried to directly behind the melting furnaces, and discharged onto an inclined, pan conveyor.

The incline lifts the scrap above the furnaces, then discharges it onto a shuttle conveyor feeding into the melting furnaces. The conveyor which feeds directly into the furnaces has a reversing motor so that with the flip of a switch, scrap can be directed to either melting furnace.

The success of the material handling system installed in this plant is demonstrated by the rapid circulation of both parts and scrap. Castings made in the morning may be assembled into finished products the same day. All scrap is recirculated and remelted quickly, often within minutes after casting.

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Spartan Casting Corp. 106
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Syntron Co. 69

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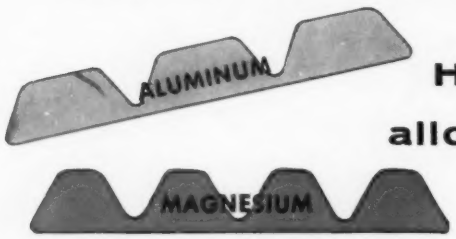
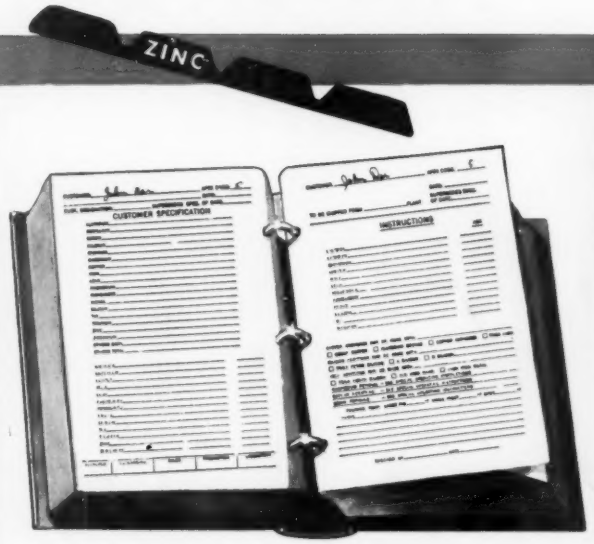


How APEX Production Control produces alloys tailored to your specifications with certified accuracy



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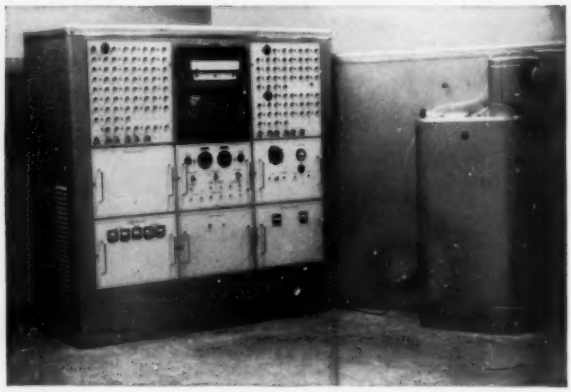

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